



D2.2: A report of policy developments and regulations that relate to digital solutions for livestock tracking

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Abstract:	This deliverable analyses policy developments and regulations that may affect the design and use of digital tools and data in livestock tracking, with a particular focus on the Digi4Live case studies. Several policies and regulations, such as the EU Green Deal, Farm to Fork Strategy, Common Agricultural Policy, Data Governance Act, Data Act, AI Act, Common European Agricultural Data Space, European Innovation Partnership for Agricultural Productivity and Sustainability, EU Code of Conduct on Agricultural Data Sharing by Contractual Agreement were examined. Key barriers and enabling factors arising from policies and regulations were identified through a literature review, a questionnaire, and exchanges with the Digi4Live partners. Recommendations are provided to help Digi4Live, as well as the livestock sector in general, navigate challenges, leverage opportunities, and effectively utilise data and new digital technologies in livestock tracking.

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List of Abbreviations and Acronyms	
AI	Artificial Intelligence
ATP	Agricultural technology providers
CAP	Common Agricultural Policy
CEADS	Common European Agricultural Data Space
CS	Case Study
DGA	Data Governance Act
DSSC	Data Spaces Support Centre
EBAF	European Board for Agriculture and Food
EDIH	European Digital Innovation Hubs
EIP-AGRI	European Innovation Partnership for Agricultural Productivity and Sustainability
ENISA	European Union Agency for Cybersecurity
EU	European Union
EUDR	Regulation on Deforestation-free Products
F2F	Farm to Fork
GDPR	General Data Protection Regulation
GPAI	General Purpose Artificial Intelligence
GPS	Global Positioning System
ICT	Information and communications technology
IDSA	International Data Spaces Association
IDS-RAM v4	International Data Spaces Reference Architecture Model Version 4
IoT	Internet of Things
KPI	Key Performance Indicator
LCA	Life cycle assessment
MVDS	Minimum Viable Data Space
NIS	Network and Information Systems
SME	Small and Medium-sized Enterprises
TRACES	TRAdE Control and Expert System (European Commission's online platform for certification necessary for the imports, exports, and intra-EU trade of -among others- animals and animal products)

Table: List of abbreviations and acronyms

1. Introduction

The Digi4Live is a Horizon Europe coordination and support action that aims to lead the livestock business towards further digitalization and economic, environmental, and social sustainability in line with consumers' expectations and with the ambition of more effective public administration and impactful policy. Digi4Live promotes, among other things, the establishment of standards and harmonized regulations, thereby removing technical barriers to data sharing and new data-generating technologies.

The overall objective of D2.2 is to describe and analyse key regulations and policies, their recent and anticipated development, and key barriers and enabling factors arising from these policies and regulations relating to livestock tracking. This deliverable relates to task 2.3 of Digi4Live, which identified and reviewed current policies and regulations relevant for the project, their implementation and anticipated and needed changes, opportunities, blocking factors and pain-points for data sharing for livestock tracking.

This deliverable provides information on the policy developments and regulations that may affect the design and use of digital tools in livestock tracking, with a particular focus on the Digi4Live case studies (CSs). When relevant, the potential contribution of the Digi4Live case studies to the objectives of the European Union (EU) policy documents and regulations, as well as the implications of policies and regulations for livestock tracking and the Digi4Live case studies will be pointed out. For the sake of brevity and accessibility, only the most prominent policy and regulatory frameworks will be examined here.

The identification of policy and regulatory frameworks addressed in this deliverable was a result of the review of relevant literature and texts of policy and regulatory documents, bilateral and multilateral exchanges with the project partners, and a questionnaire (Annex) that circulated within the consortium to collect insight on the partners' understanding, questions, and concerns with regards to the policy development and regulations. Partners' responses to this questionnaire have served as a key source in the identification of the issues covered, and the explanations and recommendations provided.

Most explanations in this deliverable apply to the livestock sector and in addition to most agriculture-related sectors. For this reason, this deliverable explains many implications of policies and regulations to the agri-food sector, which covers the livestock (sub)sector as well, and elaborates further in the context of the livestock sector when deemed necessary.

The deliverable is structured as follows: Chapter 2 provides an overview of EU policies and regulations on agriculture, food, environment, climate and sustainability, which either are or may be relevant for the digital and data-related livestock tracking solutions, together with their implications and the contributions of Digi4Live project. Chapter 3 examines the EU's digital policies and regulations concerning personal data protection, artificial intelligence (AI) and (re)use and sharing of data in the context of the livestock sector. Chapter 4 summarizes key barriers and enabling factors arising from the policies and regulations, which were identified through the desk research and exchanges with the Digi4Live partners. Finally, Chapter 5 provides recommendations to the project to address the identified barriers and leverage the enabling factors.

2. EU policies and regulations on agriculture, food, environment, climate and sustainability

2.1. Introduction

By enhancing the adoption of digital technologies and utilizing diverse data sources for various livestock through a comprehensive approach, the Digi4Live project and its case studies seek to comply with the EU policies and regulations on agriculture, food, environment, climate, and sustainability as well as to support the realization of their objectives. The EU has many policy documents regarding agriculture, food, environment, climate, and sustainability. Because the Digi4Live projects' ambitions relate to all these topics, various policy documents will be important for designing and carrying out studies and efforts. This chapter will examine them as well as their implementation in livestock tracking and the potential contributions of Digi4Live case studies to achieve their objectives.

The EU's Green Deal, Common Agricultural Policy (CAP) and certain other policies are crucial for creating more sustainable food systems. This is particularly relevant when considering the focus points of Digi4Live case studies, which are related to improving animal health and welfare, developing more resilient and transparent supply chains, reduction of waste and improving sustainability of livestock production, optimizing farm productivity, demonstrating compliance with regulations, and supporting policy monitoring and impact evaluations.

2.2. The European Green Deal

2.2.1. Overview

The European Green Deal¹ was presented by the European Commission in 2019 with the ambition of tackling climate and environmental-related challenges. It is a transformative growth strategy designed to create a fair and prosperous European society. It aims to establish a modern, resource-efficient, and competitive economy with net-zero greenhouse gas emissions by 2050 while decoupling economic growth from resource use. Additionally, it focuses on protecting, conserving, and enhancing the EU's natural capital as well as safeguarding citizens' health and well-being from environmental risks and impacts. This transition emphasizes fairness and inclusivity, prioritizing people and addressing the needs of regions, industries, and workers that face the most substantial challenges. The Green Deal highlights that the EU should promote and invest in the necessary digital transformation and tools as the European Commission sees them as essential enablers of the changes.

The Green Deal, composed of various elements as illustrated in Figure 1, presents a roadmap of the European Commission's strategy to put sustainability and well-being of citizens at the centre of economic policy, and the United Nations' sustainable development goals at the heart of the EU's policymaking and action.

The Green Deal is a horizontal plan of action, covering all sectors, and it requires the European Commission to issue proposals for action in several policy areas:

- Clean energy
- Sustainable industry
- Building and renovating

¹ European Commission (EC), 'Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions — The European Green Deal (COM/2019/640)'.

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- Sustainable mobility
- Biodiversity
- From farm to fork
- Eliminating pollution
- Climate action

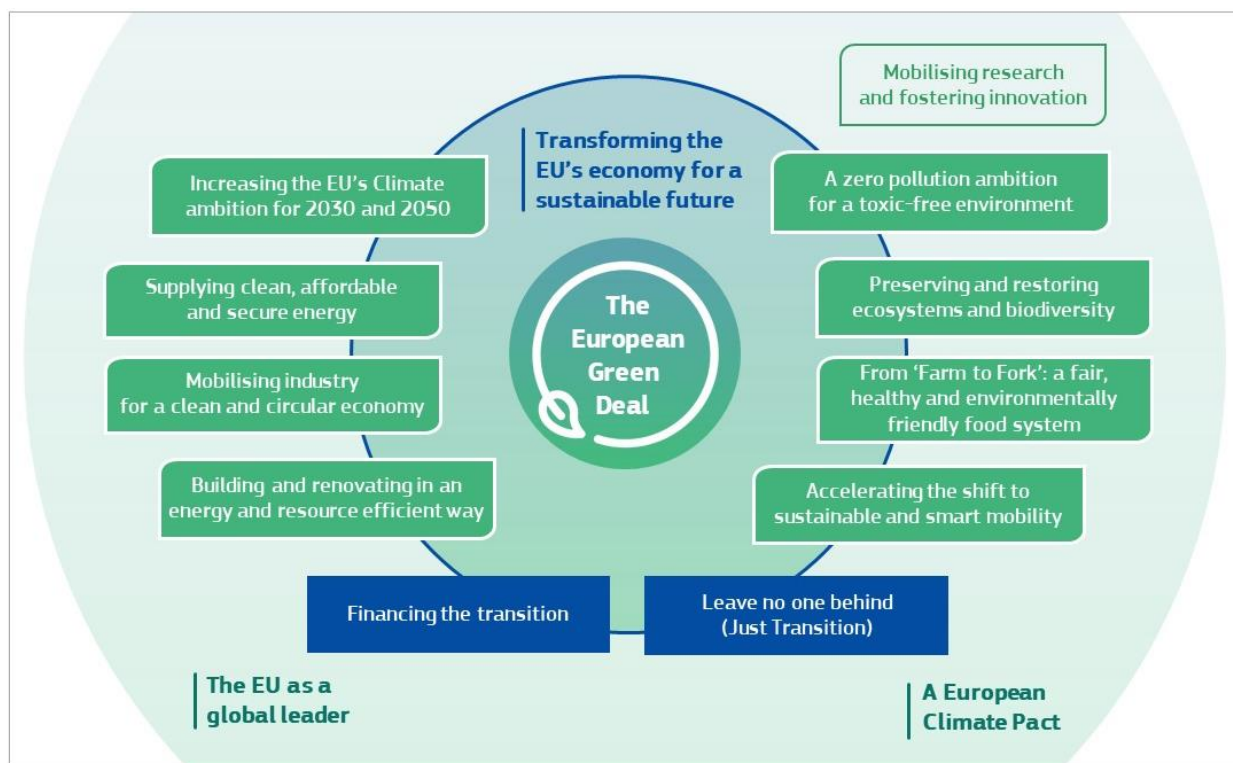


Figure 1: The European Green Deal²

The EU has adopted certain policies and laws since unveiling the Green Deal. In addition to the Farm to Fork strategy, which will be explained separately in the next section, the following policies are of particular concern to the agriculture and livestock sector:

- EU Climate Law³: The European Climate Law enshrines the goal of climate neutrality by 2050, as outlined in the European Green Deal. The regulation requires the EU institutions and Member States to take all necessary measures to meet the regulation's objectives while considering fairness, solidarity and cost-effectiveness. It also aims to ensure that all EU policies and sectors contribute to this goal.
- EU Biodiversity Strategy for 2030⁴: The objective of the EU Biodiversity Strategy, a core tenet of the EU Green Deal, is to put Europe's biodiversity on the path to recovery by 2030, benefiting people, the climate, and the planet. It seeks to enhance resilience against future threats like climate change impacts, forest fires, food insecurity, and disease outbreaks by protecting wildlife and combating illegal wildlife trade.⁵

² European Commission (EC), 'Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions — The European Green Deal (COM/2019/640)' (n 1).

³ Regulation (EU) 2021/1119 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law')

⁴ European Commission (EC), 'Communication on the EU Biodiversity Strategy for 2030 - Bringing Nature Back into Our Lives (COM 2020/380)'.

⁵ European Commission (EC), 'Biodiversity Strategy for 2030' (7 March 2025) <https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en> accessed 17 March 2025.

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- EU Regulation on Deforestation-free Products (EUDR)⁶: The EUDR, effective from the 29th of June 2023, establishes binding rules for EU operators and traders that place on the EU market or export from the EU wood, rubber, cattle, coffee, cocoa, palm oil and soy, as well as a number of derived products. The regulation aims to minimise the EU contribution to global deforestation and forest degradation, greenhouse gas emissions, and global biodiversity loss. The EUDR sets requirements on due diligence, and risk assessment and mitigation (for operators and traders) and product checks (EU Member States), and stipulates that any operator or trader who places the above-listed commodities on the EU market, or exports from it, must be able to prove that the products do not originate from recently deforested land or have contributed to forest degradation.

It is important to note that in January 2025, the European Commission presented the "Competitiveness Compass" to "boost EU's sustainable prosperity"⁷, in which the Commission has many commitments for the coming years, including building a new "Clean Industrial Deal"⁸ to "stay the course on the goals set out in the European Green Deal, decarbonise [the European] economy and bring down energy prices". The first package of proposals of the Competitiveness Compass consists of two omnibus packages, and was presented by the Commission in February 2025 with the purpose of simplifying the EU business environment.⁹ However, civil society raised concerns that these proposals undermine the EU's environmental objectives as the key sustainability laws including the Corporate Sustainability Reporting Directive (CSRD), the Corporate Sustainability Due Diligence Directive (CSDDD), and the EU Taxonomy would be targeted and this would be a major setback for transparency, accountability, and sustainable finance. It was argued that the proposed "deregulation" package would jeopardise the EU Green Deal and long-term environmental goals, favouring short-term economic gains and corporate interests¹⁰.

The EU taxonomy¹¹ is worth further explanation given its close link to the "do no significant harm" principle". The EU taxonomy is a key part of the EU's sustainable finance framework, designed to direct investments towards activities that support the transition to a net zero trajectory by 2050 and the objectives of the Green Deal. It provides a classification system with clear criteria for what constitutes environmentally sustainable economic activities. The Taxonomy Regulation, effective from the 12th of July 2020, sets out general conditions for an activity to qualify as environmentally sustainable, with the Commission defining specific criteria through delegated and implementing acts.¹² Turning to the "do no significant harm principle", it means not supporting or carrying out economic activities that do significant harm to any environmental objective, where relevant (within the meaning of Article 17 of the EU Taxonomy¹³).

⁶ Regulation (EU) 2023/1115 of the European Parliament and of the Council of 31 May 2023 on the making available on the Union market and the export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010

⁷European Commission (EC), 'Competitiveness' <https://commission.europa.eu/priorities-2024-2029/competitiveness_en> accessed 17 March 2025.

⁸ European Commission (EC), 'Clean Industrial Deal' <https://commission.europa.eu/topics/eu-competitiveness/clean-industrial-deal_en> accessed 17 March 2025.

⁹ European Commission (EC), 'Commission Proposes to Cut Red Tape and Simplify Business Environment' (26 February 2025) <https://commission.europa.eu/news/commission-proposes-cut-red-tape-and-simplify-business-environment-2025-02-26_en> accessed 17 March 2025.

¹⁰ WWF, 'Von Der Leyen's Deregulation Omnibus: A Devastating Blow to EU Environmental Objectives' (26 February 2025) <<https://www.wwf.eu/?17206391/Von-der-Leyens-deregulation-omnibus-A-devastating-blow-to-EU-environmental-objectives>> accessed 17 March 2025.

¹¹ Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088

¹² European Commission (EC), 'EU Taxonomy for Sustainable Activities' <https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en> accessed 19 March 2025.

¹³ "Article 17: Significant harm to environmental objectives

2.2.2. Implications to livestock tracking and Digi4Live

The EU Green Deal is a broad, long-term strategic framework that covers various topics. While the aspects most related to food and agriculture are left to the Farm to Fork strategy, the Green Deal draws the roadmap for the EU to achieve various objectives related to the environment, sustainability and green transformation of industries by utilizing different instruments, including innovation and research. Thus, any effort to benefit the livestock sector from new digital technologies and data in order to transform the sector and to make it more efficient, sustainable and environment-conscious must be in line with the overall objectives of the Green Deal.

Specific legal instruments related to the Green Deal are also important for the livestock sector, and this is a case for the EUDR, which lays down the due diligence, risk assessment, and risk mitigation requirements for operators and traders that place products or services on the EU market or export from it, among others, cattle and products derived from cattle. Thus, digitalisation of the supply chain and increased transparency are of utmost importance for those operators and traders to fulfil their obligations related to proving that the products do not originate from recently deforested land or have not contributed to forest degradation.

It is recognised that the Digi4Live partners and stakeholders involved in the livestock sector should follow the recent proposals by the European Commission presented in line with its "Competitiveness Compass" and the discussions about "deregulation" because there might be important changes with regard to the rules concerning environment, sustainability, and other related issues. Furthermore, any activity carried out by the Digi4Live partners should comply with the 'do no significant harm' principle.

-
1. For the purposes of point (b) of Article 3, taking into account the life cycle of the products and services provided by an economic activity, including evidence from existing life-cycle assessments, that economic activity shall be considered to significantly harm:
 - a) climate change mitigation, where that activity leads to significant greenhouse gas emissions;
 - b) climate change adaptation, where that activity leads to an increased adverse impact of the current climate and the expected future climate, on the activity itself or on people, nature or assets;
 - c) the sustainable use and protection of water and marine resources, where that activity is detrimental:
 - i) to the good status or the good ecological potential of bodies of water, including surface water and groundwater; or
 - ii) to the good environmental status of marine waters;
 - d) the circular economy, including waste prevention and recycling, where:
 - i) that activity leads to significant inefficiencies in the use of materials or in the direct or indirect use of natural resources such as non-renewable energy sources, raw materials, water and land at one or more stages of the life cycle of products, including in terms of durability, reparability, upgradability, reusability or recyclability of products;
 - ii) that activity leads to a significant increase in the generation, incineration or disposal of waste, with the exception of the incineration of non-recyclable hazardous waste; or
 - iii) the long-term disposal of waste may cause significant and long-term harm to the environment;
 - e) pollution prevention and control, where that activity leads to a significant increase in the emissions of pollutants into air, water or land, as compared with the situation before the activity started; or
 - f) the protection and restoration of biodiversity and ecosystems, where that activity is:
 - i) significantly detrimental to the good condition and resilience of ecosystems; or
 - ii) detrimental to the conservation status of habitats and species, including those of Union interest.
 2. When assessing an economic activity against the criteria set out in paragraph 1, both the environmental impact of the activity itself and the environmental impact of the products and services provided by that activity throughout their life cycle shall be taken into account, in particular by considering the production, use and end of life of those products and services."

2.3. From Farm to Fork strategy

2.3.1. Overview

The Farm to Fork (F2F) Strategy¹⁴ is a policy framework and strategy, presented by the European Commission on the 20th of May 2020, and a core component of the Green Deal. With the overall objective of improving sustainable food systems and ensuring food security, it aims to strengthen and revise the EU policies and regulations related to food and farming. More precisely, it aims to:

- Improve sustainable food systems and ensure food security.
- Ensure sustainable food production.
- Stimulate sustainable food processing, wholesale, retail, hospitality, and food services practices.
- Promote sustainable food consumption, and facilitate the shift towards healthy and sustainable diets.
- Reduce food loss and waste.

For these objectives, it foresees regulatory (including developing a legislative framework for sustainable food systems¹⁵) and non-regulatory initiatives (such as developing a contingency plan to ensure food supply and security). Additionally, the EU commits to support, through trade policies and international cooperation, the global transition to sustainable agri-food systems.

Research and innovation are seen as key instruments to enable and accelerate the transition to a fair, healthy and environmentally friendly food system as they may be useful to¹⁶:

- Resolve tensions.
- Develop and test solutions.
- Overcome barriers.
- Uncover new market opportunities.

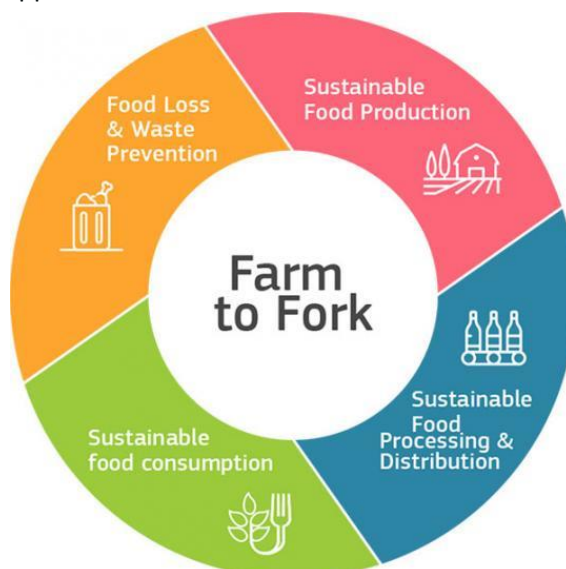


Figure 2: Farm to Fork Strategy¹⁷

¹⁴ European Commission (EC), 'Farm to Fork Strategy: For a Fair, Healthy and Environmentally-Friendly Food System' (20 May 2020) <https://food.ec.europa.eu/system/files/2020-05/f2f_action-plan_2020_strategy-info_en.pdf> accessed 7 March 2025.

¹⁵ This was supposed to be adopted by the Commission by the end of 2023 as foreseen by the Farm to Fork Strategy but has not happened.

¹⁶ European Commission (EC), 'Farm to Fork Strategy | Food Safety' <https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en> accessed 27 January 2025.

¹⁷ European Commission (EC), 'Farm to Fork Strategy | Food Safety' (n 16).

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The Farm to Fork Strategy announced that the EU would revise animal welfare legislation to align with the latest scientific evidence, broaden its scope, ease enforcement, and ensure higher animal welfare standards. Currently, the EU has **rules covering various animal species and welfare issues**, namely¹⁸:

- Directive that sets minimum standards for all farmed animals¹⁹
- Directives that protect individual farmed animals: laying hens²⁰, broilers²¹, pigs²², and calves²³
- Regulation on welfare standards for animal transport²⁴
- Regulation on conditions during stunning and slaughter²⁵

In 2023, the European Commission proposed a revision of the animal transport regulation, aiming to enhance the welfare of the 1.6 billion animals that are transported annually across and out of the EU. The Commission is also conducting preparatory work for revising the above-mentioned directives for farmed animals and the regulation on conditions during stunning and slaughter as well as preparing a new legislation proposal on animal welfare labelling.²⁶

According to a 2023 edition of the Eurobarometer survey, which is conducted regularly by the European Commission to assess and understand public opinion to better shape the CAP based on the EU citizens' needs and priorities²⁷, the majority of EU citizens ask for better EU legislation that truly protects animals, and changes in farming and industry practices (in food and animal product sectors) by prioritizing the welfare of farmed animals²⁸, in line with the civil society's call for the EU to revise the EU animal welfare legislation as previously promised as part of the Farm to Fork Strategy²⁹.

The Farm to Fork Strategy is closely related to the General Food Law Regulation³⁰ and Regulation (EU) 2017/625 on official controls along the agri-food chain. The former, covering the entire agri-food sector, lays down a framework for the development of food and feed legislation at the EU and national levels -including common definitions (such as the definitions of 'food' and 'food/feed business operator'), and objectives-, outlining principles, requirements, and procedures to ensure safety throughout all stages of production and

¹⁸ EU regulations are binding legislative acts that apply directly and uniformly across all member states without needing national transposition. In contrast, EU directives set goals that member states must achieve but allow each country to create or modify its own laws to meet these objectives, offering flexibility in implementation.

¹⁹ Council Directive 98/58/EC of 20 July 1998 concerning the protection of animals kept for farming purposes

²⁰ Council Directive 1999/74/EC of 19 July 1999 laying down minimum standards on the protection of laying hens

²¹ Council Directive 2007/43/EC of 28 June 2007 laying down minimum rules for the protection of chickens kept for meat production

²² Council Directive 2008/120/EC of 18 December 2008 laying down minimum standards for the protection of pigs

²³ Council Directive 2008/119/EC of 18 December 2008 laying down minimum standards for the protection of calves

²⁴ Council Regulation (EC) No 1/2005 of 22 December 2004 on the protection of animals during transport and related operations and amending Directive 64/442/EEC and 93/119/EC and Regulation (EC) No 1255/97

²⁵ Council Regulation (EC) No 1099/2009 of 24 September 2009 on the protection of animals at the time of killing

²⁶ European Commission (EC), 'Revision of the Animal Welfare Legislation' <https://food.ec.europa.eu/animals/animal-welfare/evaluations-and-impact-assessment/revision-animal-welfare-legislation_en> accessed 18 March 2025.

²⁷ European Commission (EC), 'Eurobarometer | Agriculture and Rural Development' (24 January 2025) <https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cap-glance/eurobarometer_en> accessed 25 January 2025.

²⁸ Eurogroup for Animals, 'Special Eurobarometer on Animal Welfare: EU Citizens Give Strong Impetus to Deliver All Animal Welfare Legislation | Eurogroup for Animals' (19 October 2023) <<https://www.eurogroupforanimals.org/news/special-eurobarometer-animal-welfare-eu-citizens-give-strong-impetus-deliver-all-animal>> accessed 25 January 2025.

²⁹ Eurogroup for Animals, 'Democratic Failure: European Commission Backtracks on Its Commitments for Animals in Work Programme | Eurogroup for Animals' (16 October 2023) <<https://www.eurogroupforanimals.org/news/democratic-failure-european-commission-backtracks-its-commitments-animals-work-programme>> accessed 25 January 2025.

³⁰ Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety

distribution. The latter establishes common rules for EU official controls to ensure proper application and enforcement of agri-food chain legislation, protecting human, animal, and plant health. It introduces a harmonized system of controls and enforcement measures, emphasizing risk-based controls.

2.3.2. Implications to livestock tracking & Digi4Live:

The Farm to Fork Strategy aims to create a more sustainable food system. A robust, effective and efficient livestock tracking would be a critical component in achieving its goals considering the environmental impact of livestock farming. The strategy indeed highlights the importance of supporting the transition towards sustainable livestock farming. Several Digi4Live case studies aim to bring solutions for improved accounting of greenhouse gas emissions in line with the strategy.

Given that the strategy considers research, innovation, and technology as key accelerators in achieving its objectives, livestock tracking solutions that utilize new technologies and data could make important impact. They can facilitate the monitoring of animal welfare, improving food safety and quality, environmental monitoring, support climate change mitigation, and facilitate compliance with related legislation. The Digi4Live case studies, which aim to develop new digitalisation concepts related to livestock tracking, can play a key role here. This seems to be even more important with the expected revision of the animal welfare legislation at the EU level, including the animal transportation rules.

2.4. Common Agricultural Policy (CAP)

2.4.1. Overview

The EU's Common Agricultural Policy, launched in 1962, is a partnership between agriculture and society, and between the EU and its farmers. It is a common policy for all the EU Member States and managed at the EU level (by the Commission's Department for Agriculture and Rural Development, which can adopt delegated and implementing acts to implement the CAP) and funded by the EU budget. The primary objectives of the CAP are to³¹:

- Support farmers and enhance agricultural productivity to ensure a consistent supply of affordable food.
- Ensure that EU farmers can earn a reasonable livelihood.
- Address climate change and promote the sustainable management of natural resources.
- Preserve rural areas and landscapes throughout the EU.
- Sustain the rural economy by creating jobs in farming, agri-food industries, and related sectors.

In line with the changing economic circumstances as well as the citizens' needs and priorities, the EU has been evolving the CAP over the years. The CAP 2023-27, which came into force on 1 January 2023, is branded as "a greener and fairer CAP" by the EU Commission and is designed as a tool to significantly contribute to the objectives of the European Green Deal, Farm to Fork Strategy, and Biodiversity Strategy. In the face of business uncertainties and challenges for farming and environmental impacts of farming, the CAP includes measures such as income support, market measures, and rural development funding³², through the tailored national CAP Strategic Plans of each EU Member State prepared according to the EU's CAP objectives (illustrated in Figure 3) and by taking into account varying national needs³³.

³¹ European Commission (EC), 'The Common Agricultural Policy at a Glance | Agriculture and Rural Development' <https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cap-glance_en> accessed 25 January 2025.

³² European Commission (EC), 'The Common Agricultural Policy at a Glance | Agriculture and Rural Development' (n 31).

³³ European Commission (EC), 'CAP Strategic Plans | Agriculture and Rural Development' (23 November 2023) <https://agriculture.ec.europa.eu/cap-my-country/cap-strategic-plans_en> accessed 25 January 2025.



Figure 3: The ten key objectives of the EU's Common Agricultural Policy (CAP) 2023-27³⁴

The CAP puts special emphasis on modernization through knowledge exchange, innovation, and digitalization to achieve all CAP objectives, and the EU's funding for research and innovation is considered important in this regard. To enhance information flow about agriculture and rural policy within the EU, the Commission has set up the EU CAP Network, which is a forum for stakeholders, including National CAP Networks, organizations, researchers, and practitioners, to share knowledge and best practices. The network supports the design and implementation of CAP strategic plans, innovation and knowledge exchange (including the European Innovation Partnership for Agricultural Productivity and Sustainability, "EIP-AGRI"), and evaluation and monitoring of the CAP. It aims to drive and steer all aspects of the EU CAP by involving interested parties, providing networking opportunities, sharing information, improving skills, encouraging the uptake of innovations in agriculture, and strengthening the Agricultural Knowledge and Innovation System (AKIS)³⁵ approaches.³⁶

In line with the recent simplification trend as shown by the Competitiveness Compass, the European Commission presented its "Vision for Agriculture and Food" on the 19th of February 2025, built on the report of the Strategic Dialogue on the Future of EU Agriculture, and in consultation with the European Board for Agriculture and Food (EBAF). The objectives of the Vision include boosting the agri-food sector's competitiveness and attractiveness, recognising agriculture and food as strategic sectors, ensuring long-term growth, innovation, and societal benefits, and fostering sustainability as well as fair living and working conditions. Based on the Vision, the European Commission plans to introduce a detailed simplification package for the existing agricultural laws, alongside an EU digital strategy aimed at facilitating the transition to digital-ready farming in the coming months. The future CAP is also planned to be simpler and more targeted, in line with the objectives of this Vision.³⁷ Overall, the Vision aims to frame the work of the second Von der Leyen Commission for its entire mandate across all policy areas that impact on agriculture and food.

³⁴ European Commission (EC), 'Key Policy Objectives of the CAP 2023-27 | Agriculture and Rural Development' (24 January 2025) <https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cap-2023-27/key-policy-objectives-cap-2023-27_en> accessed 25 January 2025.

³⁵ AKIS is defined as "the combined organisation and knowledge flows between individuals, organisations, and institutions who use and produce knowledge for agriculture and interrelated fields" by Regulation (EU) No 2021/2115.

³⁶ EU CAP Network, 'About the European CAP Network' <https://eu-cap-network.ec.europa.eu/about/eu-cap-network_en> accessed 17 March 2025.

³⁷ European Commission (EC), 'Commission Presents Its Roadmap for a Thriving EU Farming and Agri-Food Sector' (European Commission - European Commission, 19 February 2025) <https://ec.europa.eu/commission/presscorner/detail/en/ip_25_530> accessed 23 April 2025.

2.4.2. Implications to livestock tracking and Digi4Live

The CAP is vital for the future of agriculture, including the livestock sector. It aims to ensure, among others, environmental sustainability by promoting eco-friendly farming practices, fostering innovation, and encouraging practices that mitigate climate change, securing a sustainable and prosperous future for the agricultural sector. Digi4Live is one of the projects funded by the EU to achieve the objectives of CAP through innovation and digitalization³⁸. Considering its objectives and case studies, Digi4Live is closely linked to the CAP objectives.

The digitalisation of livestock tracking with innovative tools - as Digi4Live aims to demonstrate - can:

- Render the food value chain more efficient, resilient, transparent, and sustainable.
- Transform farming practices as well as other operations in the livestock supply chains, into more efficient and sustainable practices.
- Improve animal health and welfare and protect human health as well by ensuring no harmful product is present at any stage of the food supply chain.
- Decrease the effect of livestock farming in climate change through more sustainable farming and supply chain operations.
- Unlock the potential of data by ensuring its fair access, sharing and (re)use that would enable a fair income for different stakeholders (including farmers) and competitiveness (by avoiding big players monopolizing data sources and supporting innovation).

The CAP Network could offer substantial advantages in the process of transforming livestock tracking and utilizing data and innovative digital solutions, as they would offer important opportunities for the exchange of knowledge, experience and best practices.

The EU Commission's recent Vision for Agriculture and Food is also highly relevant for the livestock sector, as well as the rest of the agri-food sector, and in particular initiatives like Digi4Live since the Vision sees research, innovation and digitalisation, in addition to the simplification of EU rules, as cross-cutting drivers to achieve its purposes. Thus, it is of utmost importance for Digi4Live and the livestock sector to closely follow the Vision and the future of policy and legislative developments, as they may have a significant impact on the livestock sector and other areas related to agriculture and food. Digi4Live is advised to engage with the EBAF, which has been set up by the EU Commission as a consultative body to provide high-level advice regarding policy development, to provide input to the discussions around the future policies and regulations.

2.5. Contributions of Digi4Live case studies to policy objectives

Considering the close links between the EU Green Deal, Farm to Fork Strategy, and CAP, this section provides an overview of how the Digi4Live case studies can contribute to the EU policy objectives. Digi4Live aims to increase the potential of digital tools and data to transform the livestock sector, making it more transparent, resilient, and compliant, while facilitating policy impact assessments, enhancing efficiency and sustainability, protecting the environment, and improving the health and welfare of animals, ultimately safeguarding human life. In particular, the Digi4Live case studies can contribute to the specific EU objectives:

- **CS-A: Generation of new data sets on animal health and welfare:** By offering a framework that integrates sensor and other data and market insights, this case study aims to enhance animal welfare monitoring and, thus, promote industry advancements, create value, improve transparency, and empower regulatory bodies. This will serve to improve animal health and welfare, one of the commitments of the Farm to Fork strategy, regarding which regulatory amendments and more extensive rules are expected.

³⁸ Funded under Food, Bioeconomy, Natural Resources, Agriculture and Environment as part of the Horizon Europe.

- **CS-B: Resilience and transparency in livestock supply chains:** TRACES is the European Commission's online platform for animal and plant health certification required for the importation of animals, animal products, food and feed of non-animal origin and plants into the European Union, and the intra-EU trade and EU exports of animals and certain animal products. The system is essential to improve traceability and transparency and ensure the safety of the agri-food chain. Thus, it is closely linked to the Farm to Fork Strategy. CS-B aims to automate data management, improve welfare and control of environmental impacts, enhance transparency, foster communication among different stakeholders, alleviate administrative burdens on them, and strengthen TRACES. To achieve these, CS-B will use innovative digital solutions including automation of livestock management (integrating GPS-based location tracking) and transport logs. As a result, TRACES will become more resilient, transparent, and stronger. In addition to the Farm to Fork strategy, controlling and ideally decreasing the potential environmental impacts will be in line with the Green Deal and the CAP objectives.
- **CS-C: Robust AI methods for sensor-based animal tracking:** This case study uses sensors and AI-enhanced computer vision for automated tracking of animal locations and behaviours. The aim is to develop robust AI methods that can track animal's outdoor access and generate animal welfare key performance indicators (KPIs). While contributing to the commitments of the Farm to Fork Strategy regarding animal welfare, it offers innovative digital tools, highlighted as a key area to invest and develop by the Green Deal, the Farm to Fork Strategy and the CAP.
- **CS-D: Integration of different technologies, including animal breeding:** Modern breeding strategies use digital tools like data analytics and sensor technologies to select animals with desirable traits more efficiently. This includes selection for productivity purposes and for promoting animal welfare and sustainability of production. However, managing and integrating the vast data generated remains a challenge. CS-D addresses these challenges by fostering collaboration between the private and public sectors, aligning breeding practices with digital advancements, and organizing workshops to define key phenotypes and explore large-scale digital solutions. The study aims to improve breeding goals to provide farmers with better genetic resources and enable food chain stakeholders to benefit from individual tracking data, enhancing transparency and efficiency. CS-D ultimately aims to improve animal welfare and sustainability in line with the Farm to Fork Strategy as well as contribute to the CAP objective regarding sustainable farming.
- **CS-E: Data digitalization for environmental impact assessments using life cycle assessments (LCA):** By utilizing data and digitalisation to streamline environmental impact assessment of livestock production especially regarding data gathering to assess, this case study ultimately aims to enhance the environmental sustainability of livestock production systems. This will be an important contribution in achieving the objectives of the Green Deal and the Farm to Fork strategy for environment-friendly food systems, as well as the CAP objective for sustainable farming practices. CS-E can, directly or indirectly, contribute to other environment-related policies and legislation at the EU and national levels.
- **CS-F: Policy monitoring, policy impact and administration, EU-wide:** CS-F aims to improve monitoring efficiency, leading to more reliable compliance assessments and policy impact evaluations, and enhance transparency and accountability throughout the agricultural value chain. Because these purposes are not related to one specific policy area but in general to livestock tracking and supporting the monitoring of various relevant policies, this case study has the potential to support all the above-mentioned EU policies and contribute to future policymaking in relevant fields.

3. EU digital policies and regulations

3.1. Introduction

The European Commission recognizes the importance and transformative potential of digital technologies and data in agriculture as they are seen as an important driver to enhance farm performance by boosting sustainability, productivity, and resilience – particularly, through the use of Internet of Things (IoT) technologies, sensors, data analytics (including Artificial Intelligence (AI)), and decision support systems, enabling more tailored and precise farming activities. This is why the EU has been investing in research and innovation projects as well as deployment actions such as the Common European Agricultural Data Space (CEADS) to catalyse the digitalisation of agriculture within the EU.³⁹

The growing use of digital applications in agriculture results in the generation of vast amounts of specific and varied data, such as information on land, crops, livestock, climate, machinery, finances, and regulatory compliance. Some of this data is personal or sensitive, raising concerns among farmers about unauthorized third-party use. Protecting trade secrets and ensuring data protection and security are crucial to build trust and advancing smart farming. To address these issues, the EU has taken several legislative actions, of which the most recent is the Data Act, effective in 2025 and focusing on facilitating fair data sharing across sectors, and a group of associations from the EU agri-food chain established, in 2018, the EU Code of Conduct on agricultural data sharing, providing guidelines on agricultural data access and use. Additionally, the European strategy for data envisions the creation of CEADS to facilitate secure data sharing among private stakeholders and public authorities.⁴⁰

This chapter examines the various EU policies and regulations related to data and digitalization given their importance and (potential) significant effects on agriculture and, in particular, livestock tracking. When relevant their implication to Digi4Live case studies will also be explained as those case studies aim to develop new digitalisation concepts related to livestock tracking. These explanations will take into account the input provided by the Digi4Live partners, which have stated their commitment to comply with the applicable rules, as responses to the questionnaire shared with them to collect insight on their understanding, questions, and concerns with regard to policy developments and regulations (in Annex).

3.2. General Data Protection Regulation

3.2.1. Overview

The General Data Protection Regulation (GDPR) is a comprehensive legal framework enacted by the EU that came into effect on the 25th of May 2018. It aims to lay down rules relating to the protection of natural persons regarding processing of personal data as well as rules relating to the free movement of personal data within the EU (Art. 1). As a regulation, it also aims to harmonize personal data protection laws across the EU member states.

The GDPR applies to the processing of personal data by automated means, as well as to the processing of personal data that forms part of a filing system or is intended to form part of a filing system (Art. 2). "Personal data" means any information that relates to any natural person that can be directly or indirectly identified (data subject), while "processing" refers to any operation or set of operations performed on personal data or on sets of personal data, whether or not by automated means, such as collection, storage, use, transmission, erasure, and destruction (Art. 4).

³⁹ European Commission (EC), 'The Digitalisation of the European Agricultural Sector' (8 October 2024) <<https://digital-strategy.ec.europa.eu/en/policies/digitalisation-agriculture>> accessed 24 January 2025.

⁴⁰ European Commission (EC), 'The Digitalisation of the European Agricultural Sector' (n 39).

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The GDPR has an extraterritorial scope, reaching far beyond the EU. In addition to any data controller or processor established in the EU, it also applies to the data controllers and processors established outside the EU if their data processing activities are related to (i) offering goods or services to individuals in the EU, or (ii) monitoring the behaviour of individuals within the EU, as far as their behaviour takes place within the EU (Art. 3). GDPR defines "data controller" as any natural or legal person, public authority, agency or other body determining (alone or jointly with others) the purposes and means of the processing of personal data, and "data processor" as any natural or legal person, public authority, agency or other body processing personal data on behalf of the controller (Art.4.)

The GDPR enshrines the following key principles for all personal data processing activities (Art.5):

- Lawfulness, fairness and transparency: Personal data must be processed fairly, transparently and lawfully based on one of the legal bases listed in Art. 6 namely, consent, performance of a contract, compliance with a legal obligation, vital interests of the data subject or another natural person, public interest or exercise of official authority, legitimate interest of the controller or by a third party.
- Purpose limitation: Personal data must be collected for specified, explicit, and legitimate purposes and not further processed in a manner incompatible with those purposes.
- Data minimization: Only data necessary for the intended purpose must be collected.
- Accuracy: Personal data must be accurate and kept up to date.
- Storage limitation: Data must be kept in a form that permits identification of individuals only as long as necessary.
- Integrity and confidentiality: Personal data must be processed in a manner that ensures appropriate security.
- Accountability: The data controller must be responsible for compliance with all the above principles and be able to demonstrate such compliance.

The GDPR also stipulates (enforceable) rights to data subjects (primarily against data controllers), as listed below:

- Right to be informed (Art. 12-14): Data controllers have an obligation to inform data subjects -in a transparent, clear, concise and easily understandable way- about how their data is collected and used, including what information is collected and used, its purposes, retention periods, and with whom the information will be shared.
- Right of access (Art. 15): Data subjects have a right to access their personal data and obtain detailed information about how it is being processed.
- Right to rectification (Art. 16): Data subjects have a right to request the data controller to correct, or complete, their personal data if it is inaccurate or incomplete.
- Right to erasure (right to be forgotten) (Art. 17): Data subjects have a right to request the data controller to erase their personal data under certain conditions.
- Right to restriction of processing (Art. 18): Data subjects have a right to request the restriction of processing of their personal data in certain situations.
- Right to data portability (Art. 20): Data subjects have a right to receive, from data controller, their personal data in a structured, commonly used, and machine-readable format as well as a right to transmit those data to another controller without any hindrance from the data controller against whom the right to data portability is used. This right is enforceable if the legal basis for the data processing at the first instance was either consent or contract between the data subject and data controller (against whom the right to data portability is used).
- Right to object (Art. 21): Data subjects have a right to object to the processing of their personal data in certain circumstances.
- Right not to be subject to automated individual decision-making (Art. 22): Data subjects, with certain exemptions, have a right not to be subject to a decision based solely on automated processing,

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including profiling, which produces legal effects concerning him or her or similarly significantly affects him or her.

To enforce these rights and/or if they consider the processing of their personal data infringes the GDPR, data subjects have a right to file a complaint with a supervisory authority (Art. 77), a right to an effective judicial remedy against a supervisory authority (Art. 78), and a right to an effective judicial remedy against a controller or processor (Art. 79).

Data controller(s), as the primary party to be held accountable under the GDPR, must take appropriate technical and organizational measures to ensure the data processing takes place in compliance with the GDPR and they must also be able to demonstrate such compliance (Art.24). Data processor(s) must process data only according to instructions from the data controller(s) as stipulated in a contract or a similar legal act and collaborate with the data controller(s) to ensure compliance with the GDPR and demonstration of such compliance (Art. 28).

Some of the obligations of data controllers that are of particular importance are enshrined in the GDPR in separate articles and can be summarized as follows:

- Data protection by design and by default (Art. 25): In order to comply with the GDPR and protect the rights of data subjects, data controllers must, both while designing the means for processing and at the time of the processing itself, implement appropriate technical and organisational measures (such as pseudonymisation) which are designed to implement data-protection principles (such as data minimisation) in an effective manner and to integrate the necessary safeguards into the processing.
- Records of processing activities (Art. 30): Each data controller must maintain a record of processing activities under its responsibility. Similarly, each processor must maintain a record of all categories of processing activities carried out on behalf of a controller.
- Cooperation with the supervisory authority (Art. 31): Controllers as well as processors must cooperate, on request, with the supervisory authority in the performance of its tasks.
- Security of personal data: Data controllers and processors must implement appropriate technical and organisational measures to ensure a level of security appropriate to the risk (Art. 32). In case of a personal data breach, the data controller must notify the supervisory authority (Art. 33). If the breach is likely to result in a high risk to the rights and freedoms of natural persons, the controller must also communicate the personal data breach to the data subject (Art. 34).
- Data protection impact assessment (Art. 35): Where a type of processing, in particular, using new technologies, is likely to result in a high risk to the rights and freedoms of natural persons, the data controller must carry out an assessment of the impact of the envisaged processing operations on the protection of personal data prior to the processing. Such an assessment must also include the envisaged measures and safeguards to address the identified risks. If it indicates that the processing would result in a high risk in the absence of measures taken by the data controller to mitigate the risk, the controller must consult with the supervisory authority prior to processing (Art.36).

Transfer of any personal data from the EU to non-EU countries or international organizations can only take place according to the stringent rules of Chapter V of the GDPR (Art. 44-50).

3.2.2. Implications to livestock tracking and Digi4Live

Various innovative solutions, such as drones, sensors, robots, precision machinery, GPS technology, and data analysis tools, are increasingly being used in agriculture, including for livestock tracking purposes, to enable farmers to operate activities more productively, sustainably, and profitably⁴¹. The new technological solutions require extensive data collection and processing, especially with the rise of statistical analysis and

⁴¹ António Monteiro, Sérgio Santos and Pedro Gonçalves, 'Precision Agriculture for Crop and Livestock Farming—Brief Review' (2021) 11 Animals 2345.

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AI tools to analyse farm data for prediction of an event, solution recommendations, automated decision making and farm operation automation (such as through robots), and assisting farmers in making more informed decisions.⁴² The literature indeed highlights the potential benefits of such tools in livestock farming in animal monitoring, animal health and welfare, feed and live weight measurement, and automatic milking systems, among others.⁴³

The data collected and processed by the new technologies in farming operations can be classified as: farm data (such as livestock data and machine data) and personal data (such as name contact information, including email and location). Besides data through which farmers are directly identifiable, personal data include also data that allows indirect identification of farmers when combined with the farm data (for instance, analysing unique patterns of farming practices may allow singling out specific farms and therefore identification of farmer). Farmers have little to no control over - and sometimes information about - the collection and processing of large amounts of data. This raises concerns for farmers regarding privacy and personal data protection, and unauthorised access and sharing of their data. This includes the risk of not respecting the confidential nature of their farm and commercial data, especially by agricultural technology providers (ATPs), and this can result in farmers' unwillingness to use new agricultural technologies.⁴⁴

To minimize farmers' concerns related to privacy and data protection, encourage them to adopt and use new technologies, and leverage the benefits offered by digital tools and data, it is essential to foster trust among farmers and other stakeholders involved in livestock tracking, as well as the agricultural sector as a whole – in particular, ATPs, regulatory authorities and policymakers, and supply chain stakeholders.⁴⁵ The GDPR has a key role in achieving this because strict compliance with it, transparency regarding data collection, protection and sharing, and empowering farmers with facilitating their use of data subject rights and enabling them to have greater control over data collected from their farms can indeed address their above-mentioned concerns related to privacy, data protection and confidentiality.

Digi4Live case studies, in particular CS-C that focuses on robust AI methods for sensor-based animal tracking, plan to use sensors and computer vision, which would involve image processing. It is likely that these tools will collect personal data of farmers as well, although this would not be the main purpose of using those tools. Since the case studies also plan to use statistical analysis and AI tools, different data sets might be linked and analysed in a manner that would make it possible to identify farmers behind farm data. As a result, compliance with the GDPR would be crucial for the Digi4Live case studies in which personal data is being collected and processed.

3.3. AI act

3.3.1. Overview

The EU AI Act is the world's first law comprehensively regulating artificial intelligence (AI)⁴⁶. It is a regulation directly applicable across the EU, entered into force on 1 August 2024, and aims to improve the functioning of the internal market by promoting the use of human-centric and trustworthy AI. It seeks to ensure a high

⁴² Jasmin Kaur and others, 'Protecting Farmers' Data Privacy and Confidentiality: Recommendations and Considerations' (2022) 6 *Frontiers in Sustainable Food Systems* <<https://www.frontiersin.org/journals/sustainable-food-systems/articles/10.3389/fsufs.2022.903230/full>> accessed 20 November 2024.

⁴³ Monteiro, Santos and Gonçalves (n 41).

⁴⁴ Kaur and others (n 42).

⁴⁵ Kaur and others (n 42).

⁴⁶ European Commission (EC), 'Artificial Intelligence – Questions and Answers' (1 August 2024) <https://ec.europa.eu/commission/presscorner/api/files/document/print/en/qanda_21_1683/QANDA_21_1683_EN.pdf> accessed 4 March 2025.

level of protection for health, safety, fundamental rights, democracy, the rule of law, and the environment against the harmful effects of AI systems⁴⁷ while supporting innovation.

This regulation applies, primarily, to providers⁴⁸ and deployers⁴⁹ of AI systems -regardless of whether they are public or private entities or whether they are established or located in the EU or not- as long as the AI systems are placed on the EU market or put into service in the EU, or their outputs are used within the EU.⁵⁰

AI systems are classified according to their risk levels:

- Certain AI practices are prohibited due to the unacceptable risks they raise (Art. 6), namely:
 - AI systems including/resulting to exploitation of vulnerabilities of persons, manipulation and use of subliminal techniques, and causing harm or likely risk of such harm.
 - Social scoring.
 - Individual predictive policing based solely on profiling people or assessing their personality traits and characteristics.
 - Untargeted scraping of internet or CCTV footage for facial images to create or expand databases.
 - Emotion recognition in the workplace and education institutions, unless for medical or safety reasons.
 - Biometric categorisation of natural persons to deduce or infer their race, political opinions, trade union membership, religious or philosophical beliefs or sexual orientation (Labelling or filtering of datasets and categorising data in the field of law enforcement is not prohibited).
 - Real-time remote biometric identification in publicly accessible spaces by law enforcement (subject to exceptions).
- The majority of the rules of the AI Act regulate high-risk AI systems. These include (Art.6):
 - AI systems that are used as a safety component or a product covered by EU laws in Annex I of the AI Act AND required to undergo a third-party conformity assessment under those Annex I laws; OR
 - AI systems falling under Annex III of the AI Act⁵¹ (which may be amended by the EU Commission as noted in Art. 7) – except if the AI system in question is intended to
 - Perform a narrow procedural task;
 - Improve the result of a previously completed human activity;
 - Detect decision-making patterns or deviations from prior decision-making patterns and is not meant to replace or influence the previously completed human assessment, without proper human review; OR
 - Perform a preparatory task to an assessment relevant for the purposes of the use cases listed in Annex III.

⁴⁷ The AI Act defines the "AI system" as "a machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments".

⁴⁸ "Provider" is defined as "a natural or legal person, public authority, agency or other body that develops an AI system or a general-purpose AI model or that has an AI system or a general-purpose AI model developed and places it on the market or puts the AI system into service under its own name or trademark, whether for payment or free of charge".

⁴⁹ "Deployer" is defined as "a natural or legal person, public authority, agency or other body using an AI system under its authority except where the AI system is used in the course of a personal non-professional activity".

⁵⁰ European Commission (EC), 'Artificial Intelligence – Questions and Answers' (n 46).

⁵¹ Annex III includes use cases from non-banned biometrics; critical infrastructures; education and vocational training; employment, workers management and access to self-employment; access to and enjoyment of essential public and private services; law enforcement; migration, asylum and border control management; and administration of justice and democratic processes.

However, an AI system referred to in Annex III will always be considered high-risk where the AI system performs profiling of natural persons.

The high-risk AI systems are required to comply with various strict rules related to risk management systems, data and data governance, technical documentation, record keeping, transparency and provision of information to deployers, human oversight, and a high level of robustness, accuracy, and cybersecurity (Art. 8-15). In relation to these requirements, the AI Act stipulates various obligations for providers and deployers of high-risk AI systems and other parties involved along the AI value chain (Art. 16-27).

- Certain AI systems are subject to specific transparency obligations. This includes, for instance, AI systems intended to interact with individuals (such as chatbots), certain AI-generated content (including but not limited to deepfakes), biometric categorisation or emotion recognition systems being used (subject to exemptions related to law enforcement) (Art. 50).
- Most AI systems, given that they present minimal risk, are not subject to the obligations under the AI Act but their providers and deployers can still adopt voluntary codes of conduct⁵².

In addition to the above-explained risk-based regulation of the AI systems, the AI Act also sets specific rules for AI Act general-purpose AI (GPAI) models⁵³ (Chapter V – Art. 51-56). The providers of GPAI models have specific transparency obligations (including sharing information and documentation downstream system providers) and must respect copyright law while training the model.

When the cumulative amount of compute used for its training is above a certain threshold, the GPAI model is considered as presenting systemic risk and their providers will have other obligations related to assessing and mitigating risks, reporting serious incidents, conducting state-of-the-art tests and model evaluations and ensuring the cybersecurity of those models. The Commission may revise this threshold considering technological advancements or may identify other models as posing systemic risks based on additional criteria, such as the number of users or the model's level of autonomy.

3.3.2. Implications to livestock tracking and Digi4Live

The AI Act makes two direct references to agriculture:

- Acknowledging the potential benefits of AI in agriculture, such as improving prediction, optimizing operations, and personalizing digital solutions to enhance productivity and sustainability (Recital 4).
- Referring to Regulation (EU) No. 167/2013 on agricultural and forestry vehicles within its list of Union harmonization legislation (Section B of Annex I).

AI systems are classified as high-risk if they are intended as safety components of products or are products themselves, covered by the Union harmonisation legislation listed in Annex I, and if they require third-party conformity assessments (Art. 6). However, Regulation 167/2013 does not mandate third-party assessments, meaning AI safety components in agricultural vehicles are not automatically high-risk. The AI Act will indirectly affect Regulation 167/2013, as it is supposed to be amended in a way to take into account the AI

⁵² European Commission (EC), 'European Artificial Intelligence Act Comes into Force' (*European Commission - European Commission*, 1 August 2024) <https://ec.europa.eu/commission/presscorner/detail/en/ip_24_4123> accessed 4 March 2025.

⁵³ "General-purpose AI model" is defined as "AI model, including where such an AI model is trained with a large amount of data using self-supervision at scale, that displays significant generality and is capable of competently performing a wide range of distinct tasks regardless of the way the model is placed on the market and that can be integrated into a variety of downstream systems or applications, except AI models that are used for research, development or prototyping activities before they are placed on the market".

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Act, by introducing requirements for high-risk AI, including risk management, testing, documentation, transparency, human oversight, and cybersecurity⁵⁴.

The AI Act does not explicitly address broader AI applications in agriculture within its high-risk list, but AI adoption in agriculture is argued to present critical risks, such as food security, cybersecurity, biases in decision-making, and data collection challenges. The EU Commission may amend the high-risk AI list (Annex III) to include broader agricultural applications if they pose health, safety, or fundamental rights risks⁵⁵.

AI system providers must determine if their systems are GPAI systems or integrate GPAI models. If not, they will likely fall under minimal risk classification or certain AI systems subject to specific transparency obligations⁵⁶.

The literature⁵⁷ notes that there are initiatives developing or launching GPAI models and GPAI systems⁵⁸ for the agricultural sector, for various purposes such as offering agronomic recommendations to farmers. If a GPAI model for agriculture is to be developed, the providers are required to comply with the rules and obligations under the AI Act. While it is argued that it is unlikely that agriculture-specific AI systems will be classified as GPAI with systemic risk (due to the potential lack of the threshold compute power for training), some AI systems may integrate the already-existing GPAI models (especially, the large generative models, like Open AI's GPT-4) into their systems and the providers of such systems will be subject to the AI Act. It is noteworthy that the European Commission will develop codes of practice for GPAI systems, detailing sector-specific obligations and risk management measures, in order to ensure compliance. This is expected to address the unique challenges of AI in agriculture.⁵⁹

These explanations are important and directly relevant as the Digi4Live partners indicated that different case studies develop, or plan to use, AI tools and some may integrate language models for potential communication between farmers and the tools under development. In such cases, partners must comply with the AI Act whenever they fall under its scope.

In their current planning, the Digi4Live partners in different case studies may act as developers or deployers of AI systems but these systems do not seem to fall under high-risk level. They may be subject to specific transparency regulations as well as GPAI-related provisions (in case, for instance, a GPAI-based AI tool is integrated into the use cases). However, it is important for the partners, as well as other stakeholders in the livestock sector, to follow the developments regarding the AI Act and ensure compliance. A potential change in the classification of some AI-based agriculture tools as high-risk systems (as explained above) would result in dramatic changes in obligations and rules for the developers and deployers of such tools.

3.4. European strategy for data

3.4.1. Introduction

The European strategy for data⁶⁰, published in February 2020, is a comprehensive 5-year strategy for policy measures and investments to create a single market for data across the EU, ensuring the continent's competitiveness and data sovereignty. While this strategy prioritizes putting the interests of the individual

⁵⁴ Lucas Ramon Ciutat, 'The Impact of the EU's AI Act and Data Act on Digital Farming Technologies' in Manuel Filipe Santos and others (eds), *Progress in Artificial Intelligence* (Springer Nature Switzerland 2024).

⁵⁵ Ramon Ciutat (n 54).

⁵⁶ Ramon Ciutat (n 54).

⁵⁷ Ramon Ciutat (n 54).

⁵⁸ AI systems integrating GPAI models are considered as GPAI system if this system "this system has the capability to serve a variety of purposes" (Recital 100 of the AI Act).

⁵⁹ Ramon Ciutat (n 54).

⁶⁰ European Commission (EC), 'Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions — A European Strategy for Data (COM 2020/66 Final)'.

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at its core in accordance with European values and rights, it recognizes data as a crucial driver of economic growth, competitiveness, innovation, and job creation as well as societal progression in general. By leveraging data, the EU aims to bring benefits to both citizens and businesses in numerous ways, such as improving healthcare, building safer and cleaner transport systems, creating new products and services, decreasing the costs of public services, and improving sustainability and energy efficiency. This strategy envisions, among others, adopting necessary legislative measures regarding data governance, access and reuse, making more data available and allowing their free reuse, and investing in the development of data processing infrastructures, data sharing tools, architectures and governance mechanisms.

A key pillar of the strategy is the establishment of Common European Data Spaces, designed to ensure that data is more readily available for use in the economy and society while maintaining control for those who generate the data, be it companies, individuals, or else.

In order to create a regulatory framework for data governance, access, and reuse, protect the rights and interests of individuals while simultaneously promoting industrial and technological development, and, ultimately, achieve the objectives of the European strategy for data, the EU has adopted two key regulations, namely the Data Governance Act (DGA) and the Data Act.⁶¹

3.4.2. Data Governance Act

3.4.2.1. Overview

The Data Governance Act (DGA) entered into force on 23 June 2022 and has become applicable since 24 September 2023. It aims to (Recital 3):

- Improve conditions for data⁶² sharing in the internal market by
 - Creating a harmonised framework for data exchanges and laying down certain basic requirements for data governance.
 - Paying specific attention to facilitating cooperation between Member States.
- Develop further the borderless digital internal market and a human-centric, trustworthy and secure data society and economy.

This is in line with the EU's general ambition of fostering data sharing with the purpose of allowing broader (re)use of data and, thus, unleashing the economic potential of data⁶³. The regulation, like other relevant policy documents of the EU, lacks a definition of "data governance" but it is argued in the literature that the EU, by using this term, refers to "institutions or structures that enable and/or determine the conditions for data sharing, in close connection to the operation of data spaces"⁶⁴.

This regulation sets out:

- Conditions for the re-use, within the EU, of certain categories of data held by public sector bodies (Art. 3-9):
 - The Open Data Directive⁶⁵ of the EU regulates the reuse of open data, which is publicly available information held by the public sector, but a considerable amount of protected data

⁶¹ European Commission (EC), 'A European Strategy for Data' <<https://digital-strategy.ec.europa.eu/en/policies/strategy-data>> accessed 18 March 2025.

⁶² DGA defines "data" as "any digital representation of acts, facts or information and any compilation of such acts, facts or information, including in the form of sound, visual or audiovisual recording".

⁶³ Charlotte Ducuing, 'The Regulation of Data in the European Union: The Data Governance Act and the Data Act' in Giovanni Ziccardi, Eylül Erva Akin and Simona Klimbacher (eds), *Smart Cities, Artificial Intelligence and Digital Transformation Law* (Milano University Press 2024) 66.

⁶⁴ Ducuing (n 63) 66.

⁶⁵ Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information (recast)

(as a result of personal data protection, intellectual property rights, or commercial or statistical confidentiality) is held by the public sector. DGA outlines rules and safeguards to facilitate the reuse of such protected data, as long as such reuse is possible under any other EU or national laws, by ensuring the protected nature of such data is preserved.

- Rules for the provision of data intermediation services⁶⁶ (Art. 10-15)
 - In order to incentivize commercial data sharing, the DGA lays down rules on the provision of data intermediation services. Such services are to be provided by data intermediation services providers (also known as data intermediaries) that connect individuals and companies that hold data (data subjects -in the meaning under the GDPR- or data holders) and other entities willing to use those data (potential data users). To foster trust in data sharing through trustworthy intermediaries and to put data subjects and data holders in control of their data, the DGA enshrines stringent rules on data intermediation service providers, of which the work is required to be based on neutrality and transparency, and their functioning.
- A framework for data altruism⁶⁷ (Art. 16-25)
 - Data altruism is the voluntary sharing of data based on the consent of a data subject (in case of personal data) or the permission of a data holder (in case of non-personal data) without seeking or receiving any reward (beyond the costs incurred) for the objectives of general interest⁶⁸. Taking into account research demonstrating the willingness for data altruism but obstacles related to the lack of trusted data-sharing tools, the DGA aims to establish trusted tools to allow data to be shared easily for the common good, through trusted organisations following the EU values and principles, with the ultimate aim of unlocking the potential of data to advance research and develop better products and services⁶⁹.
- A framework for the establishment and tasks of a European Data Innovation Board (Art. 29-30)
 - The European Data Innovation Board has been established by the EU Commission as an expert group according to the composition rules of the DGA. It will advise and assist the EU

⁶⁶ "Data intermediation service" is defined by the DGA as " a service which aims to establish commercial relationships for the purposes of data sharing between an undetermined number of data subjects and data holders on the one hand and data users on the other, through technical, legal or other means, including for the purpose of exercising the rights of data subjects in relation to personal data, excluding at least the following:

- (a) services that obtain data from data holders and aggregate, enrich or transform the data for the purpose of adding substantial value to it and license the use of the resulting data to data users, without establishing a commercial relationship between data holders and data users;
- (b) services that focus on the intermediation of copyright-protected content;
- (c) services that are exclusively used by one data holder in order to enable the use of the data held by that data holder, or that are used by multiple legal persons in a closed group, including supplier or customer relationships or collaborations established by contract, in particular those that have as a main objective to ensure the functionalities of objects and devices connected to the Internet of Things;
- (d) data sharing services offered by public sector bodies that do not aim to establish commercial relationships".

⁶⁷ "Data altruism" is defined by the DGA as "the voluntary sharing of data on the basis of the consent of data subjects to process personal data pertaining to them, or permissions of data holders to allow the use of their non-personal data without seeking or receiving a reward that goes beyond compensation related to the costs that they incur where they make their data available for objectives of general interest as provided for in national law, where applicable, such as healthcare, combating climate change, improving mobility, facilitating the development, production and dissemination of official statistics, improving the provision of public services, public policy making or scientific research purposes in the general interest". For the sake of accessibility of this new term, this definition can be summarized as *voluntary data sharing without seeking or receiving any reward*.

⁶⁸ The objectives of general interest may be related to healthcare, combating climate change, improving mobility, facilitating the development, production and dissemination of official statistics, improving the provision of public services, or public policymaking, as well as scientific research (Recital 45).

⁶⁹ European Commission (EC), 'Data Governance Act Explained' <<https://digital-strategy.ec.europa.eu/en/policies/data-governance-act-explained>> accessed 5 March 2025.

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Commission regarding the DGA, propose guidelines for data spaces, and facilitate cooperation between the EU Member States and the competent authorities.

- A framework for international access and transfer of non-personal data (Art. 31)
 - While the GDPR regulates the international transfers of personal data, the DGA lays down the rules and safeguards regarding international access and transfers of non-personal data upon a request from a judicial or administrative body within a non-EU country. The rules and safeguards that are put forward in this article apply to all the subject matters of the DGA, namely, public sector data, data intermediation services and data altruism.

3.4.2.2. Implications to livestock tracking and Digi4Live

The potential implications of the DGA to the livestock sector and the Digi4Live project can be explained as follows:

- The regulation of data intermediation services has the potential to play an important role in utilising data in agriculture, including livestock tracking, as it lays down secure and trustworthy channels for commercial data sharing between different stakeholders, which might be data users (such as farmers) or data holders (such as technology providers). This brings the possibility for more data becoming available and these data can be utilised for further innovation and for more efficient, effective and sustainable operations. In addition, it allows parties who share data with data holders and users to receive a compensation for their data. This is an incentive for them to share data and thus data economy to arise.
- Altruistically shared data can be highly beneficial for various purposes such as supporting research and innovation, improved policymaking, and combatting climate change. Unlike data intermediation, incentivizing stakeholders for data altruism might be more challenging as this would not offer a compensation. Digi4Live, as a project that could benefit much from altruistically shared data, is recommended to raise awareness among different stakeholders, encourage them for data altruism, and, if possible, benefit from the altruistically shared data.
- The DGA and the Data Act are the core building blocks of the data economy and present a regulatory framework for the establishment and functioning of the data spaces. Their implementation should be followed closely and compliance with them should be ensured from the outset of any new initiative and, for the already existing ones, as soon as possible. Digi4Live intends to take all the necessary measures for compliance in its case studies, including in establishing a minimum viable data space within CS-F, as well as to support numerous stakeholders involved in livestock tracking with their preparation for and implementation of these new frameworks.
- Another important aspect of the DGA is whether providers of data intermediation services can find a sustainable business model given the strict legal regime and the necessity to find a balance between the data flows and transactions within the data market and the values, including data protection, that require protections and restrictions.⁷⁰

3.4.3. Data Act

3.4.3.1. Overview

Data Act is a regulation directly applicable across the EU. It entered into force on the 11th of January 2024 and will become applicable on the 12th of September 2025. It aims to make data, especially industrial data, more accessible and usable, foster innovation, increase data availability and ultimately enhance the EU's data economy. It also aims to ensure a fair distribution of data value among stakeholders and clarifies data usage rights and conditions.⁷¹ The Data Act lays down a harmonised framework specifying who is entitled to use

⁷⁰ Ducuing (n 63) 72.

⁷¹ European Commission (EC), 'Data Governance Act Explained' (n 69).

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product data or related service data, under which conditions and on what basis, with the goal of addressing the needs of the digital economy and removing barriers to a well-functioning internal market for data.

With the increased availability of connected products, which compose networks called Internet-of-Things (IoT) in the EU, the volume of data has increased, offering great potential for innovation and competitiveness if such data are reused. One of the objectives of the Data Act is to grant **users** of connected products, whether they are businesses or individual persons, greater control over the data they generate, while still incentivizing investments in data technologies. It also sets general conditions for mandatory data sharing between businesses.⁷²

The Act includes measures to enhance fairness and competition in the European cloud market and protect companies from unfair data-sharing terms imposed by stronger entities. It creates a mechanism for public sector bodies to request data from businesses in exceptional situations, such as emergencies, with clear rules on how these requests should be made. Furthermore, it introduces safeguards to prevent unlawful access to non-personal data by foreign governments and defines interoperability requirements to ensure seamless data flow between data processing services providers as well as across sectors and member states, facilitated by Common European Data Spaces.⁷³

The Act complements the Data Governance Act, which enhances trust in voluntary data-sharing mechanisms, by providing legal clarity on data access and use, applying to both personal and non-personal data. These regulations, together with other policy measures, aim to help to establish an EU single market for data, positioning Europe as a leader in the data economy and leveraging the growing amounts of industrial data for the benefit of the European economy and society.⁷⁴

An overview of the wide variety of issues covered by the Data Act can be provided as follows⁷⁵:

- Chapter II on business-to-business and business-to-consumer data sharing in the context of IoT (Art. 3-7) grants the users of IoT devices rights to access, use, and share with the third parties data they generate through their connected products.
- Chapter III on business-to-business data sharing (Art. 8-12) outlines the conditions under which businesses must share data with other businesses when legally required, including under the Data Act.
- Chapter IV on unfair contractual terms (Art. 13) aim to protect all businesses, particularly SMEs, against unfair contractual terms imposed on them and outlines under which conditions contractual terms will be unfair (or presumed so) and, as a result, will be non-binding on the imposed party.
- Chapter V on business-to-government data sharing (Art. 14-22) requires other data holders than individuals and public bodies to share the data they hold upon a duly reasoned request from a public sector body that demonstrates an exceptional need to use certain data to carry out its statutory duties in the public interest. This is of exceptional nature and regulated stringently.
- Chapter VI on switching between data processing services (Art. 23-31) sets the minimum requirements that providers of cloud and edge computing services must meet to facilitate interoperability and enable customers to switch service providers.
- Chapter VII on unlawful third-country government access to data (Art. 32) requires the providers of data processing services to take necessary measures to protect non-personal data stored in the EU against unlawful foreign government access requests and lays down strict conditions of where transfer of or access to such data can take place.

⁷² European Commission (EC), 'Data Act Explained' <<https://digital-strategy.ec.europa.eu/en/factpages/data-act-explained>> accessed 5 March 2025.

⁷³ European Commission (EC), 'Data Act Explained' (n 72).

⁷⁴ European Commission (EC), 'Data Act Explained' (n 72).

⁷⁵ European Commission (EC), 'Data Act Explained' (n 72).

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- Chapter VIII on interoperability (Art. 33-36) outlines the criteria that participants in data spaces must fulfil to enable data flow within and between data spaces. An EU repository will set standards and specifications for cloud interoperability.
- Chapter IX on enforcement (Art. 37-42) implies that the member states must designate one or more competent authorities to monitor and enforce the Data Act. If multiple organizations are designated as such, a 'data coordinator' must be appointed to act as the single point of contact at the national level.

3.4.3.2. Implications to livestock tracking and Digi4Live

The EU Data Act aims to address various challenges in the data economy through a comprehensive set of provisions, covering aspects such as data sharing, unfair contractual terms, public bodies' data access conditions, and interoperability. Chapter II is particularly significant as it grants binding data access and sharing rights to users of IoT devices, among other important provisions.

Despite being a valuable step forward, especially for non-personal data-driven sectors, the Data Act has limitations in the agricultural sector that are resulting from the definitions and the horizontal nature of the regulation.⁷⁶ The limitations include the following⁷⁷:

- The definitions of key terms like 'product,' 'related service,' and 'user' are narrowly construed, leading to potential confidentiality issues. For instance, the term 'user' refers to a natural or legal person who owns a connected product or to whom temporary rights to use that connected product have been contractually transferred or who receives related services. This definition does not cover common agricultural practices such as the use of cooperative machinery or services provided by contractors who own agricultural machinery and perform specific operations in farmers' fields without transferring the use rights of the machinery to farmers.
- ATPs often place multiple sensors, robots, and cameras in barns to collect data while providing services to farmers without necessarily selling or leasing the equipment that retrieves this data. In these situations, the rights-holders over the collected data would be the owners of the equipment (i.e. ATPs), not the farmers, even though the data is collected from the farms. According to the Data Act's definition of 'user', the rights-holders are the owners or leasers of IoT devices.
- The concept of 'related services' in the Data Act is also crucial to understand. Users (data right holders) are not only owners or leasers of IoT devices but also those who receive 'related services.' However, the definition of 'related service' refers to a very specific digital service that is indispensable for the functioning of the IoT device itself. This means that services provided by machine operators, such as harvesting operations, are outside the scope of the Data Act. Similarly, other data-driven decision-making services, such as irrigation suggestions, fertilizer prescriptions, and plant health monitoring solutions, are not related to the function of the IoT product and are therefore outside the scope.
- The Data Act does not cover all data collection methods. There is a distinction between 'product' or 'related service' data, which is covered under Chapter II, and other data sets that are outside the scope of the Data Act. This partial coverage leaves farmers vulnerable when the needed data is outside the scope. In other words, the Data Act fails to address farmers' data lock-in problem in its entirety. This can be summarized as limited or non-existent control of farmers over data after the collection of their data by a first-mover technology or service provider and the struggles farmers face to change switch rivals (including insurmountable expenses or technical incompatibility). Two key issues behind this problem include the lack of interoperability and data standards and the lack of

⁷⁶ Can Atik, 'Horizontal Intervention, Sectoral Challenges: Evaluating the Data Act's Impact on Agricultural Data Access Puzzle in the Emerging Digital Agriculture Sector' (2023) 51 Computer Law & Security Review 105861.

⁷⁷ Mark Ryan and others, 'The Future of Agricultural Data-Sharing Policy in Europe: Stakeholder Insights on the EU Code of Conduct' (2024) 11 Humanities and Social Sciences Communications 1.

clear enforceable rights over farm data sets, which are often non-personal and data subject rights under the GDPR are inapplicable.

- The Data Act also lacks provisions for direct access to extensive datasets by third parties without individual user requests, creating obstacles for various data reuse possibilities for further innovation. A follow-up sectoral intervention is deemed necessary to address remaining issues, specify data access and sharing rights, and ensure interoperability.
- The data rights under Chapter II of the Data Act will only apply from the 12th of September 2025, with the obligation regarding users' right to direct access from IoT devices' interfaces starting after the 12th of September 2026. This delay may give exclusive data holders opportunities to strengthen their positions before stringent rules come into effect, emphasizing the urgency of clear rules and rights in the sector.

While the Data Act provides a horizontal foundation, some sector-specific issues remain unresolved. Voluntary guidelines within the existing EU Code of Conduct on Agricultural Data Sharing by Contractual Agreement (EUCC), which is explained later in this deliverable separately, are insufficient to address these challenges. Therefore, a binding sectoral regulatory intervention might be necessary to address data access needs, balance conflicting interests among different sectoral stakeholders, and consider the challenges of rulemaking in the dynamic data landscape in digital agriculture. Alternatively, a comprehensive update to the content and enforcement design of the EUCC could help ensure sectoral compliance with the Data Act before its enforcement and fill sectoral gaps, considering there is no official sign of sectoral regulation yet.⁷⁸

The above-explained issues are closely linked to the livestock sector -as an important part of the agriculture sector-, and, thus, Digi4Live and its case studies. Some Digi4Live partners indeed hope that the adoption of the Data Act would allow access to data, which is otherwise unavailable to many, and data interoperability. While this is expected to be partially correct because of the above-made explanations, important questions persist, for instance, regarding fair compensation. They wonder what the added value of data sharing with others would be – especially for rather small players without bargaining power, like farmers.

3.4.4. Common European Data Spaces

3.4.4.1. Overview

The objective of the Common European Data Spaces is to make more data accessible and reusable in a secure and trustworthy environment, benefiting European businesses and citizens. This initiative is part of the broader effort to build a single market for data, recognizing data's transformative role in how we produce, consume, and live. From real-time navigation to personalized medicine, precision farming, and reducing CO₂ emissions, data is crucial for innovative products and services.⁷⁹

The European strategy for data, introduced in February 2020, outlines the creation of these data spaces across various strategic fields, including health, agriculture, manufacturing, energy, mobility, finance, public administration, skills, and the European Open Science Cloud. The strategy also emphasizes the importance of the Green Deal data space in achieving environmental objectives. Since then, additional data spaces in areas like media and cultural heritage have emerged. All these data spaces will ultimately be interconnected with the goal of forming a single market for data.⁸⁰

⁷⁸ Ryan and others (n 77).

⁷⁹ European Commission (EC), 'Common European Data Spaces' <<https://digital-strategy.ec.europa.eu/en/policies/data-spaces>> accessed 23 January 2025.

⁸⁰ European Commission (EC), 'Common European Data Spaces' (n 79).

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The concept of these data spaces is driven by stakeholders within each sector, leading to unique characteristics while sharing common infrastructures and governance frameworks, which facilitate data pooling, access, and sharing. Key features of the Common European Data Spaces include⁸¹:

- Open participation for all organizations and individuals.
- Secure and privacy-preserving infrastructure for data pooling, access, sharing, processing, and use.
- Clear and practical structures for accessing and using data, with fair, transparent, proportionate, and non-discriminatory access rules.
- Compliance with EU rules and values, particularly regarding personal data protection, consumer protection, and competition law.
- Empowerment of data holders to grant access to or share personal or non-personal data.
- Options for data holders to make their data available for reuse, either for free or for compensation.

The primary objective of these data spaces is to unlock the potential of data-driven innovation. Enabling trustworthy and secure data exchange across the EU will result in the control of businesses, public administrations, and individuals over the data they generate while benefiting from a safe and reliable framework for data sharing. This ultimate goal is to foster the development of new data-driven products and services, forming the backbone of a competitive and interconnected European data economy.⁸²

3.4.4.2. Common European Agricultural Data Space (CEADS)

Among the European data spaces of which the creation is envisaged by the European strategy for data, the Common European Agricultural Data Space (CEADS), which is under construction at the time of writing this deliverable, is of particular importance⁸³. This is because livestock farming is a key part of agriculture and the objectives of the CEADS are relevant for the entire agri-food sector (and potentially other relevant sectors). It aims to⁸⁴:

- Enable secure, trusted, transparent, and responsible data sharing, processing, and analysis.
- Enhance sector performance and stimulate data-driven innovations in both private and public domains.
- Accelerate the sector's twin digital and green transformations.
- Minimise administrative burdens.
- Lay the groundwork for the use of advanced, emerging AI tools

AgriDataSpace project, funded by the EU under the Digital Europe Programme, was a preparatory project to identify the necessary building blocks of the CEADS and has concluded its activities by delivering recommendations for the roll-out of the CEADS⁸⁵. As a result, a policy brief titled "Building a European Framework for the Secure and Trusted Data Space for Agriculture" was published in September 2024⁸⁶. New Horizon Europe project CEADS deploying and operating a European framework for the secure and trusted data space for agriculture, aiming to operationalize this data space, was launched in April 2025. It is

⁸¹ European Commission (EC), 'Common European Data Spaces' (n 79).

⁸² European Commission (EC), 'Common European Data Spaces' (n 79).

⁸³ One might argue that the Green Deal Data Space may also be important for the purposes of this project (as well as considering the importance and relevance of the EU Green Deal for livestock tracking). Nevertheless, the focus of this deliverable will be limited to the Common European Agricultural Data Space (CEADS) given its more direct relevance for livestock tracking and this project.

⁸⁴ European Commission (EC), 'Policy Brief – Rolling out the Common European Agricultural Data Space' (23 September 2024) <<https://digital-strategy.ec.europa.eu/en/news/policy-brief-rolling-out-common-european-agricultural-data-space>> accessed 6 March 2025.

⁸⁵ European Commission (EC), 'Policy Brief – Rolling out the Common European Agricultural Data Space' (n 84).

⁸⁶ AgriDataSpace, 'Policy Brief: Building a European Framework for the Secure and Trusted Data Space for Agriculture' (September 2024) <<https://agridataspace-csa.eu/wp-content/uploads/2024/09/AGRIDATA-SPACE-FINAL-BROCHURE-V5.pdf>> accessed 7 March 2025.

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recommended that the related developments are followed closely by the Digi4Live consortium and other related stakeholders.

Because the most up-to-date and concrete information about the CEADS is provided by this policy brief, the following explanations will be provided based on it⁸⁷, with the goal of presenting an overview of the CEADS as it is currently envisaged.

The vision presents the CEADS as a federation of Data Space Initiatives. In other words, it is a decentralised system, like a network. rather than one central European solution for the entire agri-food sector. The CEADS is built on 4 pillars:

1. Legal and ethics framework: DGA and Data Act are foundational blocks of the CEADS. To empower farmers over the use of their data, management of consent (for personal data) and permission (for non-personal data) will be key.
2. Multi-stakeholder governance – relying on the principles of
 - Minimum change – CEADS should fit into the existing landscape of data sharing initiatives.
 - Ecosystem build-up
 - Form following function – The governance model should be based on the added value of the CEADS and how to support it.
3. Sustainable business model: CEADS should serve as a trusted facilitator of cooperation, adopting a hybrid business model that combines aspects of a Data Marketplace and Open Data Policy. The pricing model should aim for cost recovery rather than profit, as high profits and margins are not acceptable.
4. Technology agnostic: While imposing trust layer requirements is important, there should be no imposed technological solutions for joining the data space.

The CEADS must be open to all different actors involved in the agri-food sector, including:

- Farmers and agricultural producers
- Data Intermediaries and service providers
- Technology and data providers
- Government bodies and regulators
- Business and industry stakeholders
- Multi-actor collaborations
- Research and academic institutions
- Financial and insurance services

To support policies towards a secure and trusted European data space for agriculture, aligned with the European Data Strategy and Green Deal, the policy brief proposes the following key recommendations which are primarily targeted at the policymakers, but which also indicate unaddressed needs for agricultural data sharing, and which may partially be addressed by other actors, including Digi4Live:

1. Defining the data coordinator role at the national level, which could play a major operational role in the implementation of the Data Act including:
 - a. Conflict resolution in data exchange.
 - b. Distinguishing personal or non-personal data in the digital agricultural sector.
2. Implementing systems for the management of consent/permission at the national level such as automated process to request consent and permission, with the goal of improved transparency.
3. Establishing digital farm identity deployment at the national level to help with the implementation of a consent/permission management system.

⁸⁷ AgriDataSpace (n 86).

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4. Standardising agricultural datasets at the national or European level
 - a. Identify priority agricultural datasets.
 - b. Evaluate the sensitivity of the information related to personal data and/or trade secrets.
 - c. Standardisation based on industrial needs (in line with regulatory frameworks such as CAP or statistical data showing the industrial needs).
5. Identifying sensitive data (such as trade secrets and personal data) within the agricultural datasets.
6. Updating the European Code of Conduct for Agricultural Data Sharing with the goal of facilitating the application of the Data Act to the agricultural sector.

Whether the CEADS will be able to achieve its ambitions and whether the policymakers and other stakeholders will act appropriately to address the needs of agricultural data sharing is currently an open question and will only be seen in the upcoming months and years.

3.4.4.3. Implications to livestock tracking and Digi4Live

Data spaces, especially the CEADS, may offer important opportunities to enhance livestock tracking by facilitating data sharing, integrating various data types, and supporting real-time monitoring. Greater access to data and its reuse is expected to foster innovation and support research and businesses to develop knowledge about more effective, efficient, and sustainable practices throughout the livestock value chain. This may result in optimizing livestock management practices for sustainability and efficiency, improving decision-making regarding health and breeding, and offering tools for risk management, such as handling disease outbreaks or supply chain disruptions.

As part of the Digi4Live project, a Minimum Viable Data Space (MVDS) is being developed under CS-F using the International Data Spaces Association (IDSA) Reference Architecture Model (IDS-RAM v4). This MVDS will serve as a secure and interoperable framework for data sharing, using Gaia-X principles for decentralised identity and consent management. VTT and LUKE are co-developing the MVDS, which will initially demonstrate livestock data sharing from LUKE's milking robot systems, applying the ICAR Animal Data Exchange standard. The setup will allow Digi4Live to practically align with emerging EU data governance and cybersecurity requirements.

CS-F aims to improve policy monitoring efficiency, leading to more reliable compliance assessments and policy impact evaluations. MDSV is key to achieving this objective as it will be useful to address the challenges in agricultural and rural policy monitoring caused by manual documentation and fragmented databases, which demand significant resources from farmers and authorities. Different data spaces initiatives can be useful also for other Digi4Live case studies in their efforts to transform livestock tracking by using digital tools and data, if data spaces will make more data accessible.

CEADS is not envisaged as one central solution for all the agriculture-related sectors across the EU, but rather as a network of data spaces. Thus, it is important for the Digi4Live project to follow the developments related to CEADS and take necessary actions to ensure technical compatibility and interoperability requirements to be a part of CEADS. This is particularly relevant for MVDS within the CS-F), as well as other potential data space initiatives related to livestock tracking. Digi4Live partners Luke and FFA are also partners of the CEADS project and will actively seek collaboration between the two projects.

In creating data spaces, the Data Spaces Support Centre (DSSC), funded by the EU under the Digital Europe programme, can provide support as it aims to accelerate the creation of European sovereign data spaces. The DSSC provides guidelines, support, and resources to help public and private entities develop data spaces that enable data sharing while maintaining data sovereignty, interoperability, and trust. The DSSC collaborates with European Digital Innovation Hubs (EDIHs) to multiply its efforts, support communities in

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deploying and joining data spaces, contribute with testing and experimentation for data spaces, and provide inputs and feedback to DSSC from regional/local communities or SMEs⁸⁸.

There are concerns, raised by some Digi4Live partners, about the governance of data spaces. The most prominent concerns include:

- Losing control over data especially regarding when and who to be forced to share data under which circumstances, and who has access rights to data.
- How to ensure fair compensation especially for farmers?
- Who owns and governs data spaces?

Governance is an important issue to be addressed for successful and wide-scale operationalization of data spaces. By taking the lens of livestock production, Digi4Live can take the initiative to propose a governance model with replicability across various data spaces, set standards, and establish best practices – in particular for the livestock tracking policy monitoring MDSV, which the CS-F is developing.

3.5. Others

3.5.1. EU Code of Conduct on Agricultural Data Sharing by Contractual Agreement (EUCC)

3.5.1.1. Overview

Despite not being one of the regulations or official policy documents, the EU Code of Conduct on Agricultural Data Sharing by Contractual Agreement (EUCC) is important to livestock tracking. EUCC contains (non-binding) guidelines for all stakeholders involved in the agri-food chain in the EU. It aims to shed light on contractual relations and provide guidance on using and sharing agricultural data. Considered as “a basis for rights and responsibilities for data sharing in the agri-food sector, with a specific farmer orientation”⁸⁹, it covers the following issues:

- Data rights (data ownership).
- Data access, control, and portability.
- Transparency and data protection.
- Privacy and security.
- Liability and intellectual property.

Nevertheless, important challenges against the EUCC have been raised in the literature, mainly related to the voluntary nature of the EUCC, non-consideration of data lock-in and portability, data rights and ownership, and mistrust in the sector⁹⁰.

A recent study that exchanged with dozens of stakeholders in workshops held in different EU member states found, that the EUCC lacks widespread awareness among stakeholders. The participants of workshops agreed that the agricultural sector needs guidance on data-sharing. Hence, the importance and utility of the EUCC are clear to establish a common framework for the sector. This need has grown after the adoption of the Data Act, which brought changes in the data sharing landscape in the agricultural sector and raised questions as explained previously. Thus, the EUCC should be updated by addressing the challenges it has faced so far, aligning with the Data Act and adapting the Data Act provisions from a sectoral perspective to address remaining challenges based on specific needs in digital agriculture as well as data reuse needs in the farm-

⁸⁸ European Commission (EC), ‘Data Spaces Support Centre | European Digital Innovation Hubs Network’ <<https://european-digital-innovation-hubs.ec.europa.eu/knowledge-hub/digitisation-projects-and-initiatives/data-spaces-support-centre>> accessed 18 March 2025.

⁸⁹ Ryan and others (n 77).

⁹⁰ Ryan and others (n 77).

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to-fork chain. The EUCC can play an important role in promoting transparency and trust among stakeholders if it is updated comprehensively. Then, effective dissemination, education, and incorporation of practical examples and model contractual terms will be key for the updated EUCC to enhance understanding and implementation within the sector. Furthermore, to incentivise compliance and build trust, it was suggested to establish a soft enforcement model for the EUCC with transparency measures and practical use cases.⁹¹

3.5.1.2. Implications to livestock tracking and Digi4Live

Although the EUCC can be seen as less relevant or outdated due to the adoption of the Data Act, it still provides important guidance especially on transparency regarding data collection and sharing. However, the EUCC should be updated to more useful for livestock tracking as well as for agriculture more broadly. Such an update should be done in line with the DGA and Data Act terminology and by addressing the unaddressed sectoral needs of agriculture as well as taking into account the technological developments in recent years (while ensuring the updated EUCC is still a technology-neutral document). Despite the voluntary nature and related limitations of its potential wide-scale adoption and implementation, an updated EUCC can complement the implementation of the Data Act in the agriculture sector, including the livestock sector, and increase transparency and trust among the stakeholders.

Digi4Live project may consider taking an initiative to update the EUCC or contribute to any such initiative if/when there is any. This would support building trust in data sharing and (re)use in the livestock sector.

3.5.2. (Cyber)Security

3.5.2.1. Overview

The EU stresses the importance of cybersecurity, in its “Cybersecurity Strategy for the Digital Decade” presented on 16 December 2020, to build “a resilient, green and digital Europe”⁹². This is indeed true for the digitalisation of agriculture given that the increasingly wider use of internet-connected devices and data-driven tools raises cybersecurity issues not only for individual farmers or technology providers but also for the entire food supply chain⁹³.

While cybersecurity, or more broadly information security,⁹⁴ is not among the focus areas of the Digi4Live project, it is still important to give a high-level overview of the related regulatory frameworks at the EU level to raise awareness among the consortium partners and livestock tracking stakeholders, as well as all other stakeholders involved in the agriculture sector. This is because security breaches can severely impact farmers, as they may result in unauthorized access to data, identity thefts, reputational and financial losses, equipment destruction, errors in system configuration and performance, and competitors gaining an unfair competitive advantage over a competitor that is a victim of a security breach, and supply chain disruptions.⁹⁵

⁹¹ Ryan and others (n 77).

⁹² European Commission (EC) and High Representative of the Union for Foreign Affairs and Security Policy, ‘Joint Communication to the European Parliament and the Council: The EU’s Cybersecurity Strategy for the Digital Decade’ (16 December 2020) <<https://digital-strategy.ec.europa.eu/en/library/eus-cybersecurity-strategy-digital-decade-0>> accessed 13 March 2025.

⁹³ Maanak Gupta and others, ‘Security and Privacy in Smart Farming: Challenges and Opportunities’ (2020) 8 IEEE Access 34564.

⁹⁴ It is worth clarifying that some might argue the focus of this sub-chapter should be “(information) security” as a broad term that includes “cybersecurity” as well as protecting information in any format from all digital and non-digital threats. Nevertheless, the term “cybersecurity” is used here given that the identified policy documents and regulations are rather related to cybersecurity.

⁹⁵ Mehdi Hazrati, Rozita Dara and Jasmin Kaur, ‘On-Farm Data Security: Practical Recommendations for Securing Farm Data’ (2022) 6 Frontiers in Sustainable Food Systems <<https://www.frontiersin.org/journals/sustainable-food-systems/articles/10.3389/fsufs.2022.884187/full>> accessed 20 November 2024.

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Unlike personal data protection regulated by the GDPR, there is no one legal instrument that regulates all (cyber)security-related issues at the EU level. However, there are a couple that are of particular importance, which can be briefly mentioned as follows:

- General Data Protection Regulation (GDPR): Although it is primarily about personal data protection and how personal data should be collected and processed, it also involves obligations to ensure personal data security, which, directly or indirectly, requires adopting a (cyber)security strategy, including organizational and technical measures⁹⁶.
- Cybersecurity Act⁹⁷: The EU Cybersecurity Act, in force since 27 June 2019, strengthens the European Union Agency for Cybersecurity (ENISA) by granting it a permanent mandate, more resources, and new tasks, including setting up and maintaining a cybersecurity certification framework for information and communications technology (ICT) products, services, and processes. ENISA also enhances operational cooperation at the EU level, assisting Member States with cybersecurity incidents and coordinating responses to large-scale cross-border cyberattacks. The Act introduces an EU-wide certification framework, allowing companies to certify their products and services once, with certificates recognised across the EU.
- NIS 2 Directive⁹⁸: The NIS 2 Directive has replaced the NIS (Network and Information Systems) Directive and its rules had to be transposed into the national laws of each EU Member State. Its purpose is to lay down a common cybersecurity regulatory framework that enhances the level of cybersecurity in the EU, requires EU Member States to strengthen cybersecurity capabilities, and introduces cybersecurity risk-management measures and reporting in critical sectors, as well as rules on cooperation, information sharing, supervision and enforcement. All the EU Member States are required to adopt a national strategy to ensure a high level of cybersecurity in the critical sectors, including food production, processing and distribution (as listed in Annex II, among "Other Critical Sectors"). Entities falling under High Criticality Sectors (Annex I) and Other Critical Sectors (if qualified at least as medium-sized enterprises) are required to implement risk management measures and report significant cybersecurity incidents, and also subject to supervision.
- Cyber Resilience Act⁹⁹: The Cyber Resilience Act enhances cybersecurity standards for products with digital components, requiring manufacturers and retailers to ensure cybersecurity throughout the product lifecycle. It addresses inadequate cybersecurity in many products, lack of timely security updates, and challenges in identifying secure products. The Act introduces mandatory cybersecurity requirements for planning, design, development, and maintenance, with some critical products needing third-party assessment before sale in the EU. It applies to most connected products, except certain exclusions, and mandates CE marking for compliance. The Act entered into force on December 10, 2024, with main obligations effective from December 11, 2027. It complements, among other legislation, the NIS2 Directive.

⁹⁶ Alessandro Mantelero and others, 'The Common EU Approach to Personal Data and Cybersecurity Regulation' (2020) 28 International Journal of Law and Information Technology 297.

⁹⁷ Regulation (EU) 2019/881 of the European Parliament and of the Council of 17 April 2019 on ENISA (the European Union Agency for Cybersecurity) and on information and communications technology cybersecurity certification and repealing Regulation (EU) No 526/2013 (Cybersecurity Act)

⁹⁸ Directive (EU) 2022/2555 of the European Parliament and of the Council of 14 December 2022 on measures for a high common level of cybersecurity across the Union, amending Regulation (EU) No 910/2014 and Directive (EU) 2018/1972, and repealing Directive (EU) 2016/1148 (NIS 2 Directive)

⁹⁹ Regulation (EU) 2024/2847 of the European Parliament and of the Council of 23 October 2024 on horizontal cybersecurity requirements for products with digital elements and amending Regulations (EU) No 168/2013 and (EU) 2019/1020 and Directive (EU) 2020/1828 (Cyber Resilience Act)

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- eIDAS (Electronic Identification and Trust Services) Regulation¹⁰⁰ & Regulation on EU European digital identity framework¹⁰¹: The eIDAS Regulation establishes a framework for secure electronic transactions across the EU. It ensures that electronic identification and trust services, such as electronic signatures and seals, are recognized and trusted across all Member States. The regulation aims to enhance digital trust, security, and interoperability, making it easier for businesses and citizens to engage in cross-border digital activities. On the other hand, the Regulation establishing the European digital identity framework mandates EU Member States to provide citizens, residents, and businesses with an EU Digital Identity Wallet by the end of 2026. This framework ensures secure online and offline identification, enabling seamless and trusted access to public and private digital services across borders. While these are not regulations that directly lay down rules on cybersecurity, legal rules on trust services, digital identity, online identification, authorisation and authentication are considered crucial for enabling data spaces.¹⁰²

3.5.2.2. Implications to livestock tracking & Digi4Live:

Security breaches can occur due to various factors, including human error, technological vulnerabilities, and physical threats. These breaches may be intentional, such as cyberattacks, or unintentional, like accidental data leaks. Given the increasing use of digital and data-intensive tools, this is true for the agriculture sector, including livestock tracking, like any other sector and ensuring robust security measures can help mitigate these risks.¹⁰³

The adoption and use of connected devices, sensors, and AI tools for various livestock tracking purposes bring multiple data points, especially considering the multi-layer smart farming architectures involving edge and cloud environments¹⁰⁴, that might be vulnerable to attacks across the livestock supply chain.

Indeed, it was stressed by the partners that one security breach may result in wide-scale -at national, European or even global levels- disruptions that may cause significant issues with food supply chain operation as well as keeping livestock animals alive. Thus, the issue of cybersecurity (of the agri-food sector, including the livestock sector) should be a concern of all the stakeholders as well as the policymakers at all levels.

The stakeholders involved in the livestock sector should:

- Keep an eye on the policy and regulatory developments related to cybersecurity and comply with the applicable rules.
- Develop cybersecurity strategies and practices, involving both technical and organizational measures, by taking into account the GDPR and NIS2 Directive (when applicable).
- Follow the certification schemes under the Cybersecurity Act and Cyber Resilience Act (when applicable) and/or use only certified products.
- Adopt and use proper trust and security services (such as EU Identity Wallet) for accessing data spaces and for data access, sharing and (re)use (potentially) even when it is done outside a data space.

¹⁰⁰ Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC

¹⁰¹ Regulation (EU) 2024/1183 of the European Parliament and of the Council of 11 April 2024 amending Regulation (EU) No 910/2014 as regards establishing the European Digital Identity Framework

¹⁰² Data Spaces Support Centre (DSSC), 'Legal | Starter Kit for Data Space Designers | Version 1.5' (September 2024) <<https://dssc.eu/space/SK/812056666/5+--+Legal>> accessed 16 March 2025.

¹⁰³ Hazrati, Dara and Kaur (n 95).

¹⁰⁴ Gupta and others (n 93).

4. Enabling factors and key barriers arising from policies and regulations

To provide a complete overview of the EU policies and regulations related to livestock tracking, it is important to shed light on the enabling factors and key barriers arising from those policies and regulations for livestock sector to leverage digital technologies and data. The explanation in this chapter will mainly be based on the explanations provided in the previous chapters as well as the input provided by the Digi4Live partners to the annexed questionnaire. In case any new information is given, this will be indicated with the reference used.

Enabling factors and opportunities arising from the EU policies and legislation can be summarised as follows:

- EU Green Deal, Farm to Fork Strategy and CAP stress the importance of digitalization, research and innovation for a transition towards sustainability, environment protection and a "greener and fairer" agriculture. Digi4Live, and any other initiative that aims to utilize data and digital tools in livestock tracking, should be encouraged to innovate and make the best use of this momentum. By using data and digital tools, Digi4Live can provide information that enables farmers to enhance animal welfare, environmental sustainability and control over their business.
- The DGA and the Data Act serve as fundamental components of the data economy, providing a regulatory framework for the creation and operation of data spaces. Trusted and secure ways for data access, sharing and re-use can revolutionise the livestock tracking sector and unlock the potential of data, AI and other digital tools, and ultimately increase the effectiveness, efficiency and sustainability of the livestock value chain. In particular, the DGA and the Data Act help to create value for data that is being collected from livestock.
- Data spaces, particularly CEADS, have the potential to provide valuable opportunities to improve livestock tracking by enabling data sharing, integrating diverse data types, and supporting real-time monitoring. Their loose definition allows the stakeholders to design data spaces according to the particular needs and dynamics of the sectors. Digi4Live can use such flexibility to design its data space within its CS-F in the most appropriate way for its objectives and needs identified.

The key barriers arising from examined policies and legislation include:

- Distinguishing between personal and non-personal data is becoming more challenging with the rise of statistical analysis and AI tools. This is because more and more data, directly or indirectly, allow the identification of individuals combined with different data sets that were traditionally seen as non-personal farm data. Thus, the categorization of personal and non-personal data is blurring, and the GDPR-compliance becomes more complex.
- A key challenge of the DGA is whether data intermediation service providers can develop sustainable business models under its strict legal regime, balancing data flows and transactions with necessary protections and restrictions.
- The Data Act establishes a broad foundation addressing data sharing, unfair contractual terms, public bodies' data access conditions, and interoperability. However, it, as a horizontal regulation applicable to all sectors, leaves certain agriculture sector-specific issues unresolved.
- Although the loose definition of data spaces and the lack of strict requirements can be seen as an advantage to designing data spaces flexibly and according to sectoral needs, there are uncertainties and questions on the stakeholders' side, including some Digi4Live partners as they indicated in their responses to the annexed questionnaire as well as in bilateral and multilateral exchanges with them. These questions are mainly about governance and business models of data spaces, conditions and requirements for data access, sharing, and use within data spaces, covering expenses of data sharing, added value from data sharing for farmers and SMEs, and fair compensation, among others.

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- The literature has pointed out the issue of the lack of wide-scale adoption of standards and best practices by agricultural technology providers.¹⁰⁵ While the EU Code of Conduct on Agricultural Data Sharing by Contractual Agreement (EUCC) was a useful tool, it was not a widely used tool and it might now be seen as irrelevant or outdated. The lack of regulatory references and encouragement (such as in the Data Act) may be seen as a missed opportunity for incentivizing the stakeholders to update the EUCC or prepare and adopt other similar instruments that can be used at a wide scale in the livestock sector.
- There are inconsistencies between the GDPR, the DGA and the DA, and the lack of clarification in their joint implementation. This may create difficulties for different stakeholders to comply with these regulations and their implementation and enforcement may also be restrained.
 - In two joint opinions published in 2021 and 2022, the data protection authorities at the EU commented on the proposals of, respectively, the DGA¹⁰⁶ and the Data Act¹⁰⁷. While some of the issues raised in these opinions were addressed in the legislative process, some persist, including but not limited to:
 - Different objectives pursued by the GDPR (centring personal data protection at its core) and the DGA and the Data Act (prioritizing data economy and broadest access and re-use of data), and potential conflict between their rules.
 - Different terminologies used – for instance, GDPR uses terms data subjects, data controllers, and data processors, the DGA and the Data Act focus on, among others, data holder and user, which may not easily coincide with the GDPR roles and may result in confusion.
 - Questions related to which authorities will act as the competent authorities and if the authorities for the DGA and the Data Act are different from the data protection authorities, how they will collaborate consistently and ensure strong and coherent implementation and enforcement.
 - Data sharing mechanisms (such as data altruism) and the obligation to make data available to public sector bodies in case of “exceptional need” raise concerns related to the GDPR principles, such as data minimization and lawfulness.
 - The DGA uses the term “general interest” whereas the GDPR and Data Act use the term “public interest”, which is an inconsistency that can make someone wonder to what extent they coincide or collide.
 - The term “data holder” is defined differently by the DGA and Data Act although these two regulations that are supposed to interact and should have been prepared with better coordination during the legislative process.
 - While the GDPR regulates the collection and processing of personal data, the DGA and the Data Act apply to both personal and non-personal data. However, it is becoming increasingly difficult, especially with technological advancements, to distinguish between personal and non-personal data. Thus, there may be challenges in implementing different legal regimes for personal and non-personal data under these regulations.

¹⁰⁵ Kaur and others (n 42).

¹⁰⁶ European Data Protection Board (EDPB) and European Data Protection Supervisor (EDPS), ‘EDPB-EDPS Joint Opinion 03/2021 on the Proposal for a Regulation of the European Parliament and of the Council on European Data Governance (Data Governance Act)’ (11 March 2021) <https://www.edpb.europa.eu/our-work-tools/our-documents/edpb-edps-joint-opinion/edpb-edps-joint-opinion-032021-proposal_en> accessed 19 March 2025.

¹⁰⁷ European Data Protection Board (EDPB) and European Data Protection Supervisor (EDPS), ‘EDPB-EDPS Joint Opinion 2/2022 on the Proposal of the European Parliament and of the Council on Harmonised Rules on Fair Access to and Use of Data (Data Act)’ (4 May 2022) <https://www.edpb.europa.eu/our-work-tools/our-documents/edpb-edps-joint-opinion/edpb-edps-joint-opinion-22022-proposal-european_en> accessed 19 March 2025.

5. Recommendations for Digi4Live

Building on the previous chapters and examinations, this chapter provides recommendations on how Digi4Live should address the barriers or utilise the enabling factors, which were identified in the previous chapter. While the momentum for recommendation to the policymakers is in WP7, several recommendations for the project were identified.

1. Monitoring regulatory developments

The EU's regulatory landscape is evolving, especially regarding sustainability, environment, agriculture, food, and digital technologies and data. Digi4Live stakeholders should stay informed and ensure compliance. Important areas to follow include the EU Commission's recent "Vision for Agriculture and Food" and the future legislative and policy developments on the agri-food sector, and the "Competitiveness Compass" initiatives and discussions on "simplification" and "deregulation", which may affect rules on the environment, sustainability and other related issues. Digi4Live should also follow the regulatory developments related to animal welfare and transportation.

2. Compliance with EU digital and data regulations

Digi4Live's case studies utilise AI, sensors, cameras and data sharing. Stakeholders must comply with EU digital and data laws as outlined in Chapter 3. Strategies and mechanisms should be put in place to ensure ongoing compliance.

3. Promoting Data Altruism

Digi4Live can benefit from altruistically shared data. Hence, it should raise awareness and promote data altruism among stakeholders.

4. Creating a data space and governance model

Data spaces are still in the early phases and stakeholders have considerable flexibility to design them according to the needs and dynamics of the sectors. Digi4Live is advised to be a pioneer by creating a data space with a robust governance model for "CS-F: Policy monitoring, policy impact and administration, EU-wide", actively contributing to the development and deployment of the CEADS, and collaborating with other stakeholders on the recommendations, given in the previously explained policy brief rolling out the CEADS, to address the unmet needs for agriculture sectors. Engaging with the Data Spaces Support Centre for their contribution to establishing a Digi4Live data space would be very useful.

5. Contributing to the update of the EU Code of Conduct on Agricultural Data Sharing

One of the recommendations of the CEADS policy brief is the update of the EU Code of Conduct on Agricultural Data Sharing by Contractual Agreement (EUCC). An update of this code will be useful to address the sector-specific needs that are not addressed by the Data Act and to strengthen trust among the stakeholders. Digi4Live can take the initiative to lead such efforts or contribute to them when there is any effort in this direction.

6. Stakeholder Engagement & Policy Collaboration

As a coordination and support action that aims to engage with over 1,000 stakeholders including policymakers and regulatory authorities, Digi4Live is advised to take initiatives to engage with stakeholders, such as the Thematic Expert Panels that are already part of the project's work plan, and collaborate with them to identify the unmet needs of the livestock sector and address those needs as well as challenges that the digitalisation of the livestock sector faces. Digi4Live would benefit from engaging with the EU CAP Network to better contribute to the implementation of the CAP through its case studies. Digi4Live is also advised to engage with the members of the EBAF, which has a role as a consultative body to provide high-

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level advice to the EU Commission regarding policy development regarding agriculture and food. Furthermore, Digi4Live is advised to engage with policymakers and lawmakers at both the EU and national levels and to urge them to actively contribute to their commitments disclosed in their policy documents. Digital Transition Toolkit, which is a toolkit for policymakers on the strategic conversations on digital transition for farmers and rural communities¹⁰⁸, may be useful in this regard.

7. Developing tools, standards and best practices for data sharing

Digi4Live should develop and disseminate tools, standards, guidelines, and best practices for data governance and sharing in the livestock sector. This is already part of the project's work plan and will build trust, encourage the adoption of data sharing and contribute to ensuring fair compensation and added value for farmers and SMEs, addressing concerns about data sharing. Addressing the concerns of farmers and SMEs, which is a priority for the project partners as they indicated, is of particular importance for their involvement in the data economy.

¹⁰⁸ European Commission (EC), 'Digital Transition Toolkit' <https://knowledge4policy.ec.europa.eu/foresight/topic/digital-transition-toolkit_en> accessed 19 March 2025.

6. Conclusion

Digi4Live project aims to contribute to the digital transformation of the European livestock sector by making it more sustainable, efficient, resilient, and consumer-centric by leveraging cutting-edge technologies and fostering collaboration among a diverse group of partners. The project also seeks to ensure that issues related to trust, cost, and legal compliance are adequately addressed. All this is closely linked to the EU's ambitions towards sustainability, a green economy, protecting biodiversity, fighting climate change, and supporting agriculture, as outlined in the EU policy documents such as the European Green Deal and Common Agricultural Policy, by leveraging the new EU data regulations and initiatives, such as AI Act, Data Act, Data Governance Act and European Data Spaces, as well as recent technological advancements.

This deliverable has provided a comprehensive analysis of the policy developments and regulations impacting the design and use of digital tools and data in livestock tracking, with a focus on the Digi4Live case studies. By examining the most prominent policy and regulatory frameworks, the potential contributions of Digi4Live to the objectives of EU policy documents and the implications of numerous policies and regulations for livestock tracking have been identified. Through a combination of literature review, bilateral and multilateral consultations with the project partners, and a consortium-wide questionnaire, key barriers and enabling factors arising from these policies and regulations have been identified.

The findings underscore the complex regulatory landscape that requires strict compliance efforts, especially with the rules related to data protection, access, sharing and re-use. However, not all the relevant aspects are regulated in a manner fully to address the sectoral needs, and this requires going beyond compliance with the laws. It would, only then, be possible to utilize digital technologies and data to enhance the sustainability, effectiveness, efficiency, and transparency of the livestock sector. The recommendations provided aim to help project partners navigate these challenges and leverage opportunities, ensuring that digital tools are effectively integrated into livestock tracking practices. This deliverable serves as a valuable resource for understanding the regulatory landscape and guiding future efforts in the digital transformation of livestock tracking.

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8. Annex: Digi4Live questionnaire on regulatory and policy matters

We request all the partners to provide their input **by 29 November 2024 Friday at the latest**.

The **primary objective** of this questionnaire is to seek your input to identify the most important policy and regulatory issues regarding livestock tracking. Your input will contribute to KUL's work in *Task 2.3 "Analyse regulatory & policy matters relating to livestock tracking"* and, eventually, to *Deliverable 2.2 "A report of policy developments and regulations that relate to digital solution for livestock tracking"*, which aims to provide the consortium useful guidance throughout the project lifetime.

Your responses to certain questions will be helpful also for *Work Package 6 "Assess the effects of selected approaches/concepts & solutions"*.

This questionnaire is composed of 17 questions (4 introductory questions about you and 13 questions on the subject matter). It should not take longer than 1 hour.

All the information you provide will be used solely for the project purposes and will be deleted at the latest at the end of the project.

For all questions or clarification requests, please feel free to contact Halid Kayhan from KU Leuven (KUL).

Initial Questions

1. Your name:
2. Your organization:
3. Contact information (email):
4. Are you involved in any use case(s)? Which one(s)?

General Questions on Policy and Regulatory Frameworks

Background information:

There will be numerous policy and regulatory frameworks applicable to livestock tracking and more efficient and sustainable use and sharing of livestock data. Among the most prominent ones are:

EU Policies and Regulations on Agriculture, Food, Environment, Climate and Sustainability

- **EU Green Deal**
 - From Farm to Fork Strategy
 - EU 2030 Biodiversity Strategy
 - Research and Innovation Policies - e.g., Horizon Europe (to complement: Digital Europe Programme, ...) - some related projects and initiatives:
 - Data4Food2030
 - AgriDataSpace
 - CEADS (Common Agricultural Data Space) – to be launched in January 2025 (to be built on AgriDataSpace)

- **Common Agricultural Policy (2023-2027)**

- European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI)
- European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI) Strategic Implementation Plan (dated 2013, to contribute the “Europe 2020” Strategy)

EU Digital Policies & Regulations

- Europe’s Digital Decade Policy (2020-2030)
- GDPR (came into force in 2018)
- AI Act (came into force in August 2024 – currently, in transitional period)
- European Strategy for Data
 - Data Governance Act (came into force in September 2023)
 - Common European Data Spaces Policies
 - Data Act (will come into force on 12 September 2025; will apply 12 months later)
- Others
- In addition,
 - EU Code of Conduct on Agricultural Data Sharing by Contractual Agreement (EUCC)

5. How do you find these policy and regulatory frameworks relevant to your case study and livestock tracking more generally?
6. How does your case study (or Digi4Live project - if you are not involved in any case study) contribute to the realization of the objectives of these policy frameworks? (Particular attention should be paid to the *EU Policies and Regulations on Agriculture, Food, Environment, Climate and Sustainability* -see above-)
7. Do you think any other policy and legal frameworks will have a significant impact on your case study or livestock tracking in general? If so, which one(s) and why?

Questions on EU Data Regulations

8. What are your main data-related concerns (in your use case and Digi4Live)?
9. How do the currently applicable or future policy and legal frameworks (such as the GDPR, AI Act, Data Act) impact your concerns? Are those concerns arising from the gaps, shortcomings, or over-regulation in certain frameworks? Can these frameworks address those concerns? Please explain.
10. Are you aware of any other shortcomings, gaps, or bottlenecks arising from regulations concerning data sharing and integration in livestock tracking?
11. What may the policy and regulatory frameworks offer to unlock the potential of data in livestock tracking?

Questions on EU Code of Conduct on Agricultural Data Sharing by Contractual Agreement(EUCC)

12. How useful do you find the EU Code of Conduct on Agricultural Data Sharing by Contractual Agreement (EUCC), adopted in 2018, especially for your use case and livestock tracking in more general?
13. What aspects of the EUCC do function well, and what do not? Do you think it should be updated, why/how?

Questions on Data Spaces

14. To what extent are you familiar with European data spaces? Do you think data spaces will create opportunities, blocking factors, and/or pain-points for data sharing for livestock tracking? Please explain.
15. What points should be clarified concerning data spaces? How can/should those points be clarified and by whom?
16. What questions should be posed to stakeholders in the livestock tracking sector to gather insights on their perspectives and understanding of European data spaces and the EU's related policies and regulations?

Questions on Authorities

17. What might be near-future needs, expectations and requirements regarding data and data management by competent authorities with regard to livestock tracking?